MAY, 1938
Vol. II. No. 12

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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

■ *Synthetic Resins* ■ *Casein* ■ *Rubber* ■ *Cellulose Compositions* ■

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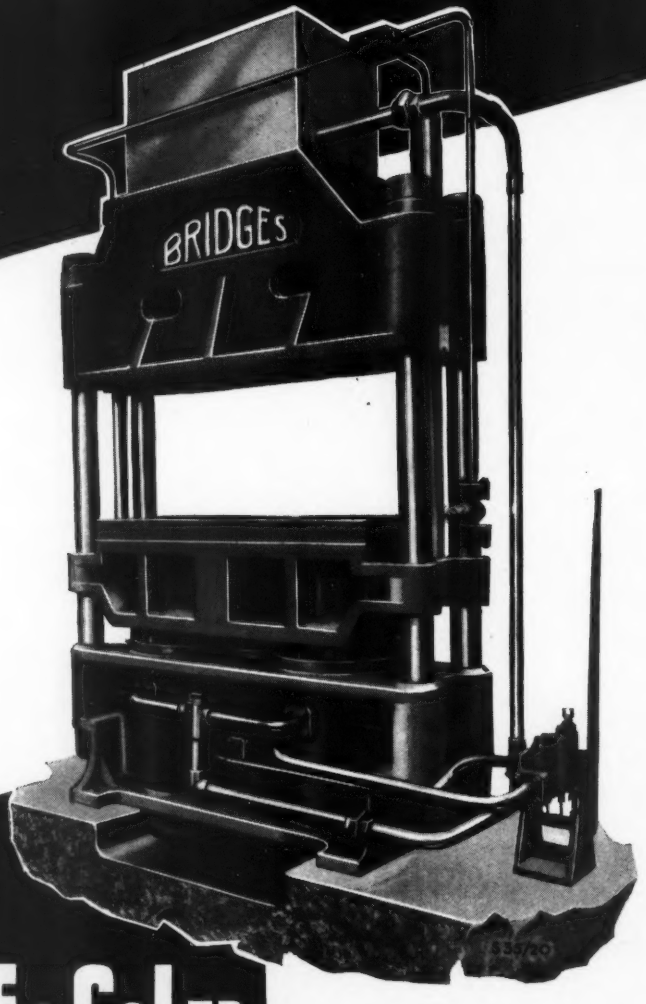

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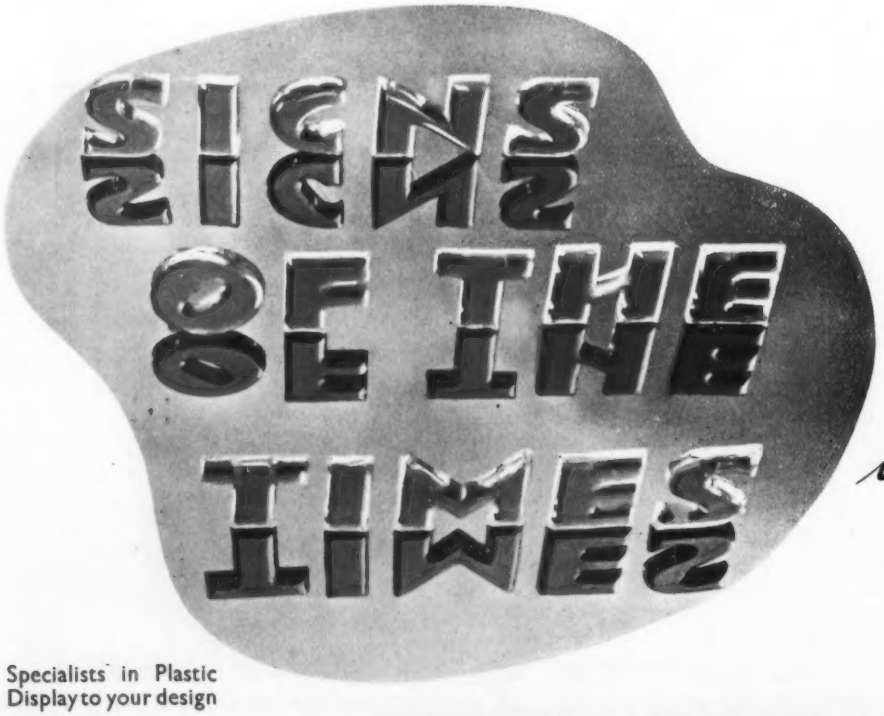

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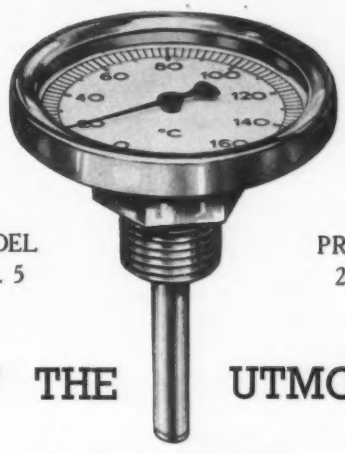

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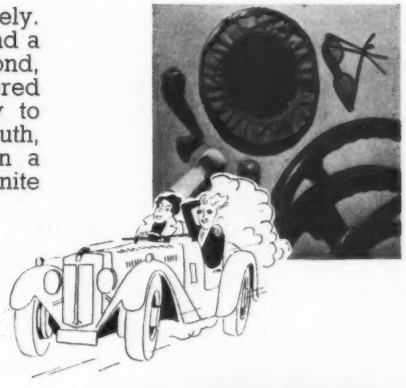
Continued on page vi

2. THROUGH LIFE WITH BX PLASTICS

Over the wall from Peter Peabody lives a girl whose name is Prudence. A little younger than Peter, they've been friends since they could walk. And though they're both growing up—or perhaps because of it—often in these last Easter Holidays Peter found himself looking out of the window and hoping he'd catch sight of her. She's in the garden most afternoons, knitting under the apple tree. Her long blue Lactoid needles glint and click and the ball of wool grows smaller.

1 *Lactoid knitting pins, paper knife and measure.*

Two things have happened to Peter lately. First, he has had to buy himself a razor, and a shaving brush, made of BX materials. Second, Aunt Jemima (rest her soul) has been gathered to her fathers. She has left her money to Peter, and he, with the improvidence of youth, is going to spend a good deal of it on a wonderful sports two-seater. It has a Xylonite steering wheel, control knobs and so on, and Xylonite side-screens. Prudence, of course, has had an urgent invitation to go out and test the new toy. Sports cars ruffle one's hair, but what does it matter if a girl has a Xylonite comb in her bag?



2 *Steering wheel, fog disc, goggles. Gear lever knob, door handle, shaving brush.*

Prudence will be twenty-one on Thursday. Peter is giving her a matched set of hair-brush, mirror, clothes brush and powder boxes in one of the charming designs which are made from BX plastic material. And, on the day before the birthday, they're going out to dine and dance. If a suitable opportunity should occur, Peter intends to ask Prudence a rather important question!

★ *(NEXT MONTH: A WEDDING IN THE PEABODY FAMILY!)*

3 *Toilet Set.*

In every home you will find a BX Plastic—even though it is only the eyelet covering on a shoe! The British Xylonite Company Limited makes three famous Thermo-Plastic raw materials—Xylonite (Celluloid), Bexoid (Safety Celluloid) and Lactoid (Casein). From these materials other firms throughout the country manufacture an enormous range of everyday goods which are not only useful, but durable and beautiful.

Full information on any branch of Plastic Production may be had from the Company's Head Office: Hale End, London, E.4.

THE BRITISH XYLONITE COMPANY LIMITED

MAKERS AND MANIPULATORS OF PLASTICS

HALE END, LONDON, E.4. AND BRANTHAM

DIRECTORY OF THE INDUSTRY

CONTINUED FROM PAGE iv.

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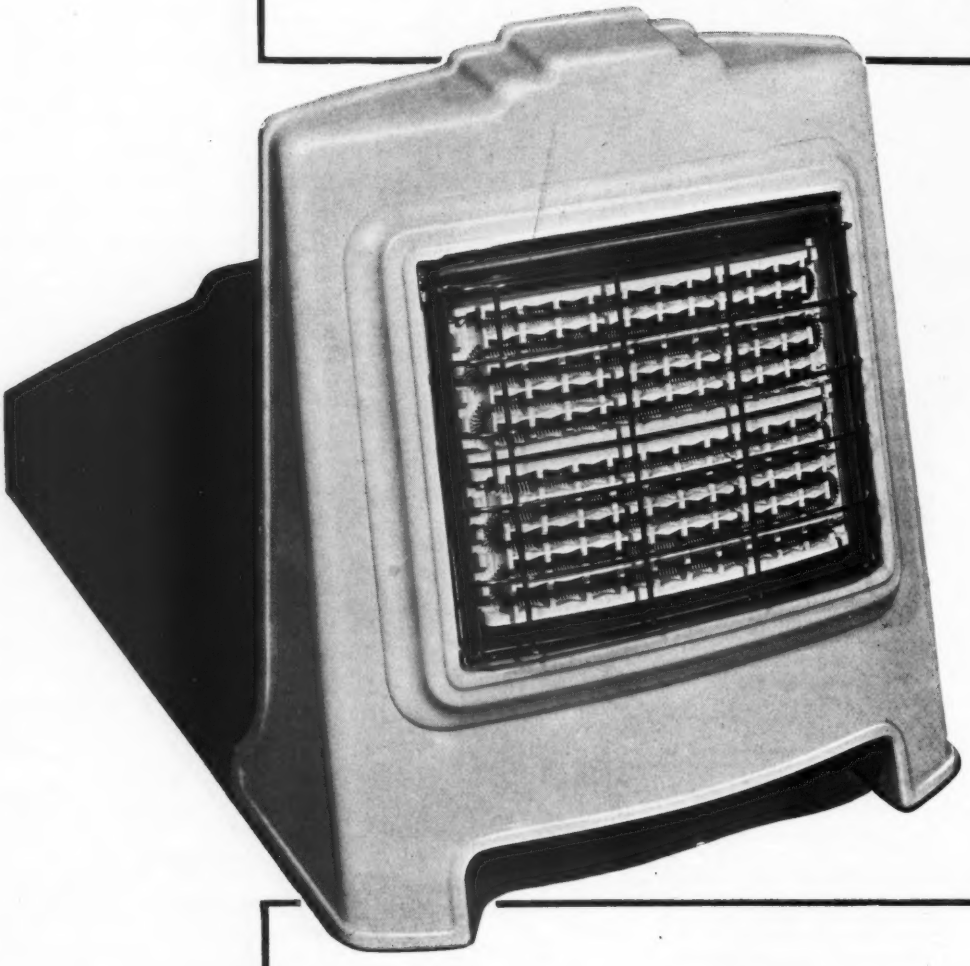

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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials.

Vol. II. MAY, 1938 No. 12

Index to Advertisers.

Ashdown, H. E. (Birmingham), Ltd. i.
Ashworth & Meredith, Ltd. .. .. xvi.
Bakelite Ltd. .. .. Front Cover
Beetle Products Co., Ltd. .. .. —
Birkbys, Ltd. .. .. vii.
Bridge, David, & Co., Ltd. Inside Front Cover
British Celanese, Ltd. .. .. .. —
British Cellophane Ltd. .. .. x.
British Industrial Plastics, Ltd. .. viii.
British Rototherm Co., Ltd. .. .. iii.
British Xylonite Co., Ltd. .. .. v.
Catalin, Ltd. .. .. xv.
Crystalate Mouldings .. .. .. —
Dowding & Doll, Ltd. .. .. .. —
Ebonestos Industries, Ltd. .. .. —
Ellison Insulation, Ltd. .. .. xii.
Erinoid, Ltd. .. Inside Back Cover
Expanded Rubber Co., Ltd. .. .. —
Firth, Thos., & John Brown, Ltd. .. —
Gardner, Wm., & Sons (Gloucester), Ltd. xvi.
Hamburger, M. .. .. xvii.
Heywood & Bryett .. .. .. —
Hutchinson & Co. (Publishers), Ltd. xvi.
Injection Moulders, Ltd. .. .. —
London Moulders, Ltd. .. .. ii.
Lorival Manufacturing Co. (1921), Ltd. xiii.
May & Baker, Ltd. .. .. .. ii.
M.C.L. and Repitition, Ltd. .. .. xviii.
Mouldrite, Ltd. .. .. xi.
N. B. Mouldings, Ltd. .. .. .. —
Norcross Panel Plywood Co., Ltd. .. xviii.
Permastic, Ltd. .. .. iii.
Pulsometer Engineering Co., Ltd. .. xviii.
Ray Mouldings, Ltd. .. .. .. —
Rootes Mouldings, Ltd. .. .. xii.
Steele & Cowlishaw .. .. .. xvii.
Streetly Manufacturing Co., Ltd. .. —
Technical Machines & Accessories .. —
Thomson, L., Ltd. .. .. .. xviii.
Treforest Trading Estate .. .. xiv.
United Glass Bottle Mfrs., Ltd. Back Cover

Announcements.

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TEMPLE PRESS LIMITED

Proprietors, Printers and Publishers of "The Motor," "The Light Car," "The Commercial Motor," "Motor Cycling," "Cycling," "The Motor Ship," "The Motor Boat," "The Oil Engine" "The Aeroplane," "Light Metals," and "Chain & Multiple Store."

5-17, Rosebery Avenue, London, E.C.1

Other notices appear on last page.

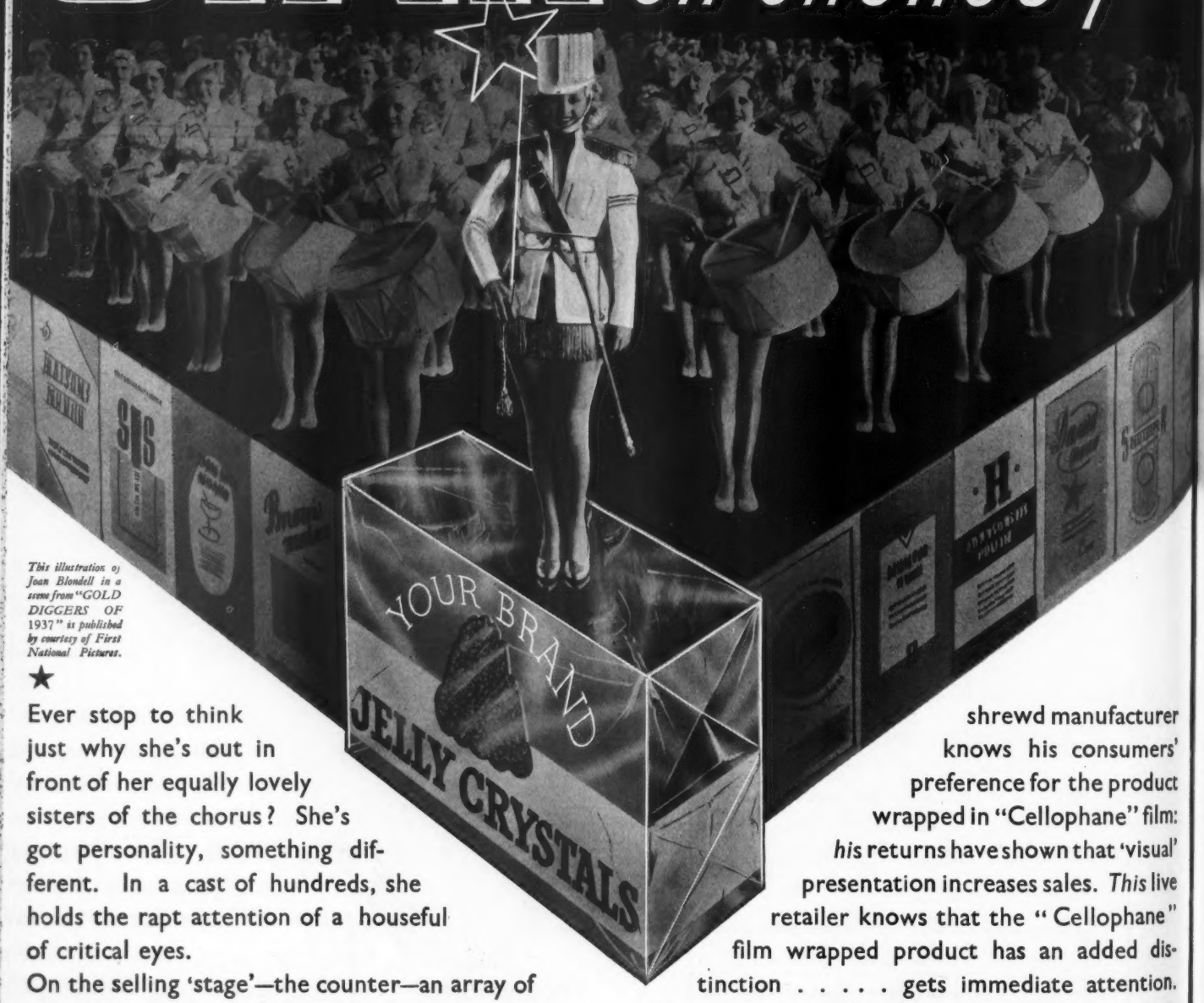
CONTENTS

	PAGE
Editorial	147
Novelty is Worth a Premium	149
A Clean Sweep with Plastics	150
Hungarian Rhapsody	153
Better Equipment for the Tannery	154
Armorial Bearings in Plastics	156
Rubber in the News	157
Lining Steel Plant with Rubber	158
Spot Welded	161
Seeing is Believing	162
General Release	164
Phenol Formaldehyde Resins in the Electrical Industry, by E. E. Halls	166
Ideas, by the Editor	168
Architectural Lighting	169
Speeding up Modern Machinery	170

Production:

Notes and Comments	171
Wanted—A Plastics House	173
Inquiries and Answers	175
Trade and Personal Notes	177
New Materials, New Plant, New Methods	179
Patents	180

STAR OR CHORUS?



This illustration of Joan Blondell in a scene from "GOLD DIGGERS OF 1937" is published by courtesy of First National Pictures.

★

Ever stop to think just why she's out in front of her equally lovely sisters of the chorus? She's got personality, something different. In a cast of hundreds, she holds the rapt attention of a houseful of critical eyes.

On the selling 'stage'—the counter—an array of attractively packed products. Out in front of them, the product wrapped in "Cellophane" film. *This* shrewd manufacturer knows his consumers' preference for the product wrapped in "Cellophane" film: *his* returns have shown that 'visual' presentation increases sales. *This* live retailer knows that the "Cellophane" film wrapped product has an added distinction . . . . . gets immediate attention. Star or chorus? Ever stop to think into which category your pack falls?

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Do not hesitate to consult our Packaging Development Department who will create a special pack or packs for you to see—entirely without obligation on your part. Send your sample and enquiries, please, to :—

PROMOTION DIVISION, BRITISH CELLOPHANE LTD., 17-19, STRATFORD PLACE, LONDON, W.1

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Vol. II. No. 12 MAY, 1938

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - 5-17, Rosebery Avenue, London, E.C.1

AIRCRAFT AND MOTORCARS

THE news that the nation's present effort to increase our aeroplane output for the Air Arm is still not sufficient for us to keep pace with foreign nations, and that our present output is to be doubled or trebled if still insufficient, gave no untoward shock to the people's equanimity, for we are all convinced that it is, under present conditions, the right step to take. At the same time, the Air Ministry are aware that such efforts must not run counter to the equally important manufacture of civil aircraft, which must be encouraged to grow also with the rapidity commensurate with the demand.

Although we can scarcely be pleased at the creation of such fleets for warfare, at least there is some satisfaction for the plastics industry in that the modern aeroplane is increasing steadily in what might be called "plastics" content.

We are not yet at the stage of the moulded aeroplane, as some excitable journalists seem to think. The main structure is still of metal or of wood, but a host of subsidiary items are of plastics—windscreens, dashboards, electrical equipment, laminated and moulded, gun turrets and light-guards. As we have already indicated, the air-screw of resin-impregnated wood and spar and wing structures are no longer a mere dream of the future, but are in production. Several concerns have interested themselves in such manufacture, which is now proceeding satisfactorily, although perhaps at little more than an experimental rate.

The latest information we have on the applications of plastics to aircraft is from the Bushing Co., Ltd., of Hepburn-on-Tyne, who inform us of the use of Texolex, their resin-impregnated fabric, in relation to the variable-pitch air-screws produced by the De Havilland Co. This exceedingly strong and tough material is used for the barrel support, the piston ring, cylinder-chafing ring and shim-plate chafing ring, that is at important points to prevent fretting between the surfaces due to vibration. The purpose of the material is, of course, to prevent "picking up" of metal surfaces which might result if Texolex were not used. As regards strength of the material, the ability to resist fatigue due to vibration has already been proved by long tests under working conditions, which show that its impact strength is of a very high order.

The second type of transport we deal with here, namely, motor transport, is not at the moment in such a flourishing condition as motorcar manufacturers would wish. High taxes and a penny increase in the price of petrol do not tempt the taxpayer to sell his old car and buy a new one, nor does it tempt the newcomer to savour the glories of the road. Where there is buying of new cars it is the purchase of the lower-powered cars rather than high-powered ones. The latest Ministry of Transport Statistics show especially an increasing demand for 8 h.p. cars and under. Part of this increase is probably due also to an influx of ex-motorcycle users, who realize the comfort in a car for little increased cost.

There is little need to indicate the existing wide use of plastics in the motor trade. What we wish to point out is that it is probably in the production of the very small car that the biggest changes beneficial to our industry may come. For the smaller-powered cars must have light bodies, a condition that could be easily reached with a more extensive use of plastics. It is the small car, too, that would lend itself more readily to construction from plastic units for the body.

The motorcar industry in this country must study the problem of the 8 h.p. car and under more closely than ever, for in the past two years German and Italian cars have been pouring into Gt. Britain in increasing numbers. In 1935 288 cars were imported from Germany. By 1937 this had increased to 5,410 from Germany and 2,165 from Italy in the first nine months of the year. In 1938 the first two months has already seen the importation of 2,339 from Germany alone!

Such imports should be made to cease by immediate Government action, but we also feel sure that the plastics industry can play a great part in solving the more important problem of producing a more efficient British car.

Coating Pipes with Plastics

THERE has always been an urgent need on the part of engineers for the protection of underground piping, especially that which is buried for considerable periods in corrosive soil. The principal deterrent for

treatment of piping has not only been the important one of cost, but also that of suitable material.

Experiments that have been carried out in America indicate that the problem has been solved to the satisfaction of the workers concerned by the choice of celluloid in the form of sheet 8/1000 in. and 10/1000 in. thick. The earlier experiments were started in 1934 and the results have proved so promising that comparatively large-scale use is being made of celluloid.

The original test had been carried out by first treating the pipe with a coating of asphalt and then wrapping the celluloid sheet over this. Subsequent methods are slightly altered, the pipe being given two coatings of black paint, the first allowed to dry hard. The wrapping of celluloid was carried out immediately the second coat of paint was applied, so that the latter remained soft. Special cements have been devised for jointing the celluloid and a novel method introduced to prevent serious slipping of the covering. Furthermore, instances have arisen when, in view of uncommonly high acidity in the soil, it has been necessary to put two coverings of celluloid.

We remember that some years ago tests using special synthetic-resin varnishes failed to stand up to the rigorous conditions involved. The varnishes were highly resistant to the acid soils but had a strong tendency to flake off the pipe. The success of celluloid is no doubt in part due to its great flexibility and strength.

Plastic Teeth

At a meeting of the German Dentists' Organization in Berlin extraordinary claims were made that synthetic resin had proved better for false teeth than many materials employed hitherto. Gold, rubber and porcelain would, a speaker said, be entirely replaced for dental purposes by the new German material.

The following claims were made for synthetic resin. It was said to be healthier in the mouth, while tests had shown that a tooth of the new material was ten times stronger in resisting pressure than porcelain. While under a hammer test porcelain teeth broke into many pieces the tooth of synthetic resin stood the strain. Nicotine had no effect, as repeated trials had proved, so that smokers with synthetic resin teeth would not be troubled with discoloured teeth.

Further tests had been made with numerous acids and alkalis, foods of all kinds, tooth pastes, and with fruits, without any change in the new teeth. The idea came from a Berlin dentist, Herr Ernst Schnebel. Whole sets of teeth were made now of synthetic resin combined with palladium silver alloy.

Dental treatment would also become cheaper as a result. Only one machine is needed for the production which can take place in every dentist's workroom, no expensive laboratory being necessary. The leader of the German dentists has arranged for 700 training courses to be held to enable the 30,000 dentists in the country to become acquainted with the new methods.

Cellulose Product for Improving Concrete.

Recent experiments carried out by a large concrete contracting firm in the United States have resulted in the perfecting of a new cellulose surfacing material. This is claimed to be specially useful for repairing concrete and makes a smooth, solid and permanent patch right up to feather edge. The new product provides a firmer, tougher, smoother-wearing surface and, in addition, it dries fast enough to answer all practical requirements. As regards the economics of the process, the manufacturers, Flexrock Co., say that it costs only 10 cents to 14 cents per square foot.

Shellac for Plywood Manufacture.

Chemists working at the Indian Lac Research Institute have found that when aleuritic acid, one of the major components of shellac, was treated with phthalic anhydride and glycerine, they obtained a substance possessing excellent adhesive properties. This new synthetic glue can be used to laminate safety glass and also acts as a strong adhesive for wood. If the hopes of the Institute are fulfilled, it is probable that the process will be adopted commercially and be able to make use of shellac not required for ordinary industrial purposes. These experiments have given considerable impetus to the search for new applications of shellac.

Micarta for A.R.P.

The brushes, shovels and other tools used for decontamination work are now equipped with wooden handles which, being naturally absorbent, are liable to soak up poisonous gases and smokes. To overcome all risk of contamination and blistering by handling these tools, it is suggested that a completely non-absorbent and non-corrosive material be used for handles instead of wood. Micarta seems an obvious choice as it is hard, resilient and will not warp, expand or shrink and is not affected by water, oil, or, indeed, any of the toxic gases used in modern warfare.

"Cellophane" Finds Important Electrical Applications

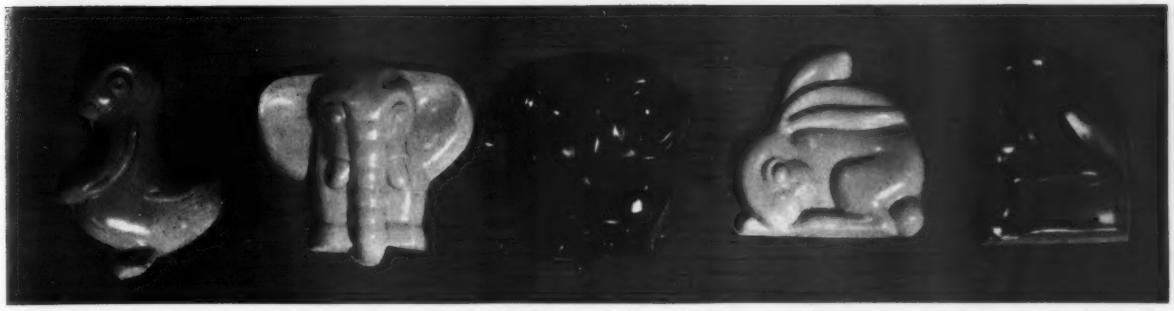
In the working parts of electrical gadgets it is vital to save space. More space means more wire on the coils and this, of course, means more power. Space saved means compactness, less weight, and lower costs.

The molecular structure of "Cellophane" has peculiar compactness and density. This makes it non-porous, impermeable to oil, water and other solvents. It possesses great tensile strength, resistance to heat and electricity. Thus a thin winding of "Cellophane" on copper wire is enabling considerable increases of power overload capacity to be made in many important electrical systems.

According to the latest issue of the "Du Pont Magazine," the U.S. Navy are now using coloured "Cellophane" ribbons as means of instant identification in large rubber-covered cables.

More Aircraft Mouldings.

The intense re-armament programme which is responsible for so much activity in the aircraft industry at the present time is also benefiting the plastics industry. Among the many interesting new productions are the moulded cases for Negretti and Zambra aeronautical instruments. These are moulded of Bakelite by Ebonestos Industries, Ltd. For high-altitude flying it is now usual for pilots to wear electrically heated goggles, and the frames of these are moulded for Siebe Gorman and Co., Ltd., from a special shock-resisting grade of Bakelite moulding material by D. H. Bonella and Sons, Ltd.



Novelty is Worth a Premium

MR. ANTHONY BERTRAM, the well-known authority on industrial design, has said that novelty is "art with knobs on," and there are many who will agree with him that there is something more than a little ludicrous about new productions which rely almost solely upon the novelty of their design to sustain sales. It would, however, be unjust to condemn novelty out of hand as something quite useless, seeing that more than one moulder has reaped the benefit of a bright idea in plastics. Provided novelty of design is coupled with genuine practical qualities, the success of any new line is assured. It must be emphasized that novelty and utility are interdependent, but the prospective purchaser who is attracted in the first place by certain unusual features of a new article, takes its practical qualities on trust. It is only when he tries it out for himself or receives the experiences of others that the question of repeat sales is influenced. Therefore, novelty is responsible for opening up new markets and utility for developing and expanding them.

Eye appeal can be created in several ways, most of them being closely related. First comes shape. This is necessarily of vital importance as it gives the only tangible clue to the customer interested in the product. Whilst simplicity of design is desirable, care has to be taken to avoid stripping the shape of ornamentation to such an extent that the article looks bare and unattractive. We might well take a hint from the States, where manufacturers try their best to give designs a luxury appearance and achieve their object by streamlining, using two or more different materials, such as thermo-plastic, thermo-setting resin and metal, and exploiting colour contrasts and harmony.

Second in this synthesis of eye appeal comes colour, which contributes so much to form. Primaries are too crude and preference is now generally given to those delicate pastel shades; ivory is a particular favourite as it tones so well with most colours.

Third, and finally, there is utility or function, the success of which must necessarily be the main factor in building up sales.

In some of the markets for plastic goods it is the unusual that meets with the most demand, and this is particularly noticeable in the case of display stands. Yet it is a fact that many of those at present in use show very little evidence of imagination and merely act as a convenient but nondescript platform for showing off somebody's soap, perfume, toilet powder, etc. Surely the stand itself can boost the goods it displays?

There seems to be an obvious opportunity here for rich colour to contribute something startling and sensational to the display unit; and why use only one colour? Surely it is quite a practical proposition to build up the stand in two or more sections, using cast resin sections, stamped laminated sheeting or mouldings; the first-named being probably the most suitable. Even with the simplest geometrical shapes in varied colours it is possible to build up a number of unusual exhibits for windows and counters, and the trained designer should experience little difficulty in evolving sales-promoting schemes. It is not so much a question of building an ingenious array of shelves on which a firm's products can be displayed, but rather of constructing a unit which will do two things: first, attract immediate attention; second, focus it on the article on show and the name of the firm manufacturing it. The clever use of transparent, translucent and coloured materials is the way to achieve success, and there is plenty of scope for new ideas, particularly for novel shirt display boxes, hosiery packages and gift boxes. The men's wear trade is as yet virgin soil for the plastic manufacturer interested in display and packaging.

(Top) Children's sand toys moulded of Richelain plastic by the Richardson Company, U.S.A.

(Bottom) Bex medicine cup which is calibrated for teaspoon, dessertspoon and tablespoon doses.

A CLEAN SWEEP WITH PLASTICS

Millions of Moulded Parts a Year for HOOVER CLEANERS

Model 160, the latest Hoover ensemble, has 23 moulded parts including the large motor hood.

"IT beats—as it sweeps—as it cleans."

There are few housewives in this country who do not understand what this clever slogan means, and, moreover, appreciate that the cleaner it so accurately describes is one of the most welcome labour-saving devices in the home of 1938.

Yes! The Hoover certainly is a great boon to the busy housewife, and it is interesting to try to analyse some of the reasons for its popularity. First of all, performance. It is designed and built for long and heavy service not only as a carpet cleaner, but also as a convenient cleaner for all other furnishings. Then again, the Hoover machine is well balanced, easy to handle and lift, and possesses an attractive streamlined appearance which makes a ready appeal to the discriminating woman buyer. Of considerable importance in this rather sketchy analysis of popularity comes the question of policy which, although not so obvious, contributes largely towards success. Hoover, Ltd., has, since the introduction of its first model 30 years ago, set out to make the Rolls-Royce of vacuum cleaners.

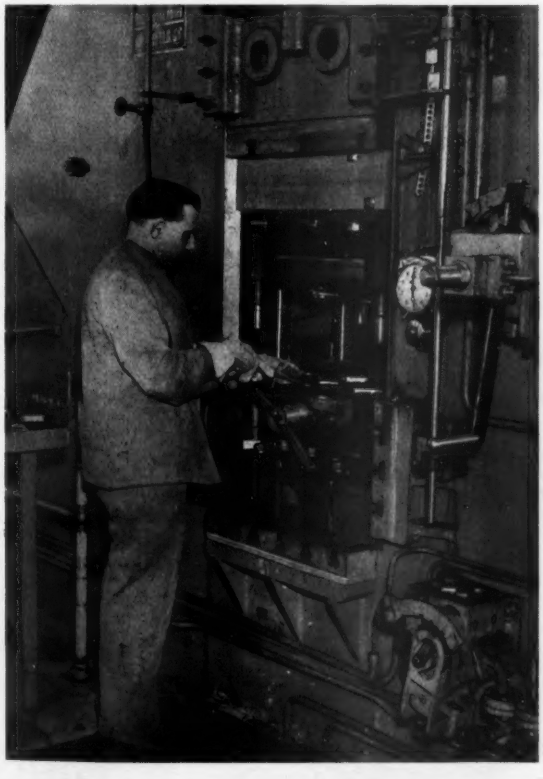
The Keller diesinking machine is used for making moulding tools.

Quality has always been regarded as the primary consideration and an economic price the second. No one challenges the fact to-day that this far-sighted policy has proved remarkably successful.

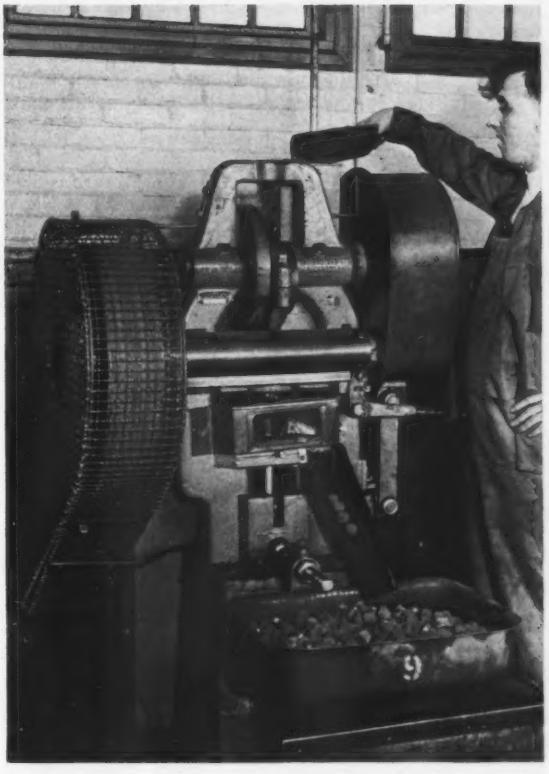
It is natural to expect that a firm of this standing should use only those materials for the construction of their cleaners which could be relied upon to give unquestioned service. Every single item going into the Hoover is subjected to the most rigorous service and laboratory tests.

In view of this strict manufacturing policy, it is particularly pleasing to the plastic industry to find that its materials are accepted by Hoover, Ltd., and now widely used. Last year several million moulded parts were used in the assembly of Hoover cleaners, and the latest cleaning ensemble, introduced in March, 1938, known at Perivale as Model 160, has 23 moulded items. These include the motor hood, which measures 10 ins. long, 5 ins. wide and 4 ins. deep, and motor casings, previously made of steel pressing or die castings, are now moulded of phenol formaldehyde resin, which is fabric filled and specially developed to resist breakage.

Although plastic mouldings were used for certain small fittings, such as adapters and plugs, for the first Hoover models, it was not until about two years ago that the company decided to make generous use of plastics. It was realized that moulded components were popular not only because of their streamlined appearance, smooth and attractive finish, and the comfortable and equable temperature of the surface, but because they rendered the machine more completely insulated. The substitution of mouldings for metal parts also reduced the weight of the machine and made it more convenient for general use.



Removing moulded parts from one of the Becker and Van Hullen presses.



Preparing pellets of moulding powder ready for the presses. This is a Daniels pelletting press.

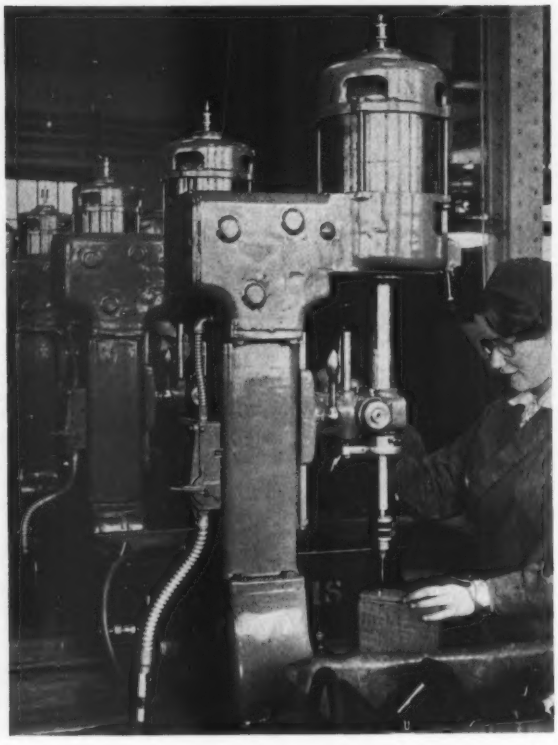
Production at the Perivale factory of Hoover, Ltd., is almost entirely self-contained, and not only is moulding carried out in the firm's own presses, but the majority of the moulds themselves are made at Perivale in an up-to-date toolroom, which uses such machines as Keller and Gorton diesinkers.

A visit to the Hoover moulding shop affords striking evidence that the close scientific control of moulding practice contributes largely to the high quality of the moulded parts. Not only is every moulding carefully examined, but samples of each batch are subjected in the laboratory to the acetone extraction and impact strength tests. These give an immediate clue to the adequacy of the cure and the strength of the resultant part. In addition to these tests, the assembled models with moulded parts fitted in position are tried out on various ingenious abuse testers, which afford valuable evidence as to the ability of all the parts to withstand the most severe conditions of service. Switches are turned on and off a few thousand times, the moulded wheels on various models are bumped backwards and forwards over an uneven metal surface, and batteries of machines are kept running continuously on test racks, which duplicate the conditions of actual use in the home.

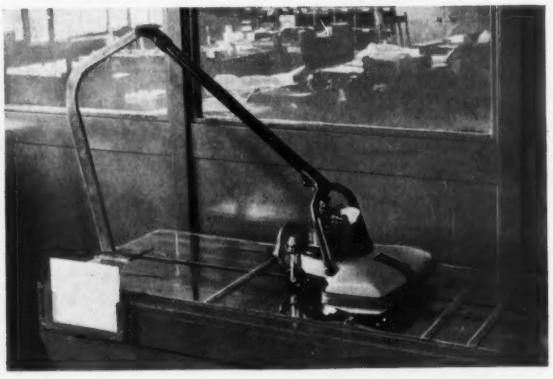
Most people like to know something about the initial stages of a successful product, and often ask whether the engineers in charge of production get together and evolve a new design, or is the work left to an industrial designer? Actually the Hoover cleaner is a combina-

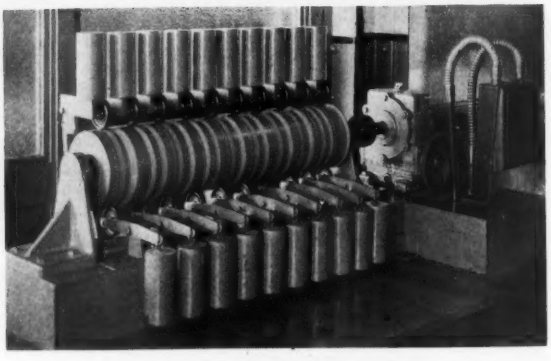
tion of both. Experienced engineers and an industrial designer collaborate, the engineers producing what is essential for cleaning efficiency, and the designer contributing his share towards the final result based on his knowledge and anticipation of trends in industrial design.

New knowledge of materials and methods gained by experience in the factory or service department has resulted in many changes over the year in the Hoover cleaner both as regards efficiency and appearance. Judging from the success of the latest model, it is reasonable to predict that from now onwards plastics will contribute a great deal towards the efficiency and pleasing appearance of the Hoover. Already it has made possible the economic production of a more colourful, lighter and more versatile machine.



Finishing-off the brush-fixing holes in moulded brush nozzles.





These abuse tests show how the assembled machine and also separate wheels stand up to continual wear.

Some of the largest moulded components of the latest Hoover model.

HUNGARIAN RHAPSODY

FROM time to time, in accordance with our policy, we publish notes on foreign happenings. By such methods we hope to give manufacturers in this country some idea of progress abroad, of new designs and methods, so that they may be introduced here if considered worthy or even foster trade where that is possible.

The latest news regarding foreign progress in plastics is the publication of the first issue of *Müanyag-ipar*, the journal of the Hungarian Artificial Resin Producers Association, edited by Dr. D. Szilagyi. We might add that it is the first occasion that we have really desired an international language, for the journal seems full of valuable material, and Hungarian or Magyar is quite beyond us. Fortunately, there is no lack of translators, and from time to time we hope to "lift" interesting topics from this journal. We have already formed friendly connections with the very amiable editor.

We take the opportunity of congratulating the editor on the noteworthy step he has taken, and of wishing the Hungarian industry success. As we have already pointed out, we in this country can learn much from abroad, and foreigners, equally, can learn much from us.

Of outstanding importance as a unit of plastics manufacture is the coffee mill shown in the accompanying photograph, the main body, drawer and handle being made of Futurit, a moulding powder made from amino resin. The mill was pressed by Kábelgyár, Ltd., of Budapest. It is remarkably attractive not only because we believe it is the first coffee mill that has been made of plastics, but also because of the excellence of the design and general appearance. Judging from the photograph only, for we have not, of course, seen the original, the workmanship appears excellent. Of special note is the fact that plastics can be employed for the grinding of a material very susceptible to deleterious odours, a matter of no small importance.

We do not presume, unfortunately enough, that the publicity we give to this object will be of much use to manufacturers in this country, except indirectly. For we are not a nation of coffee drinkers. In France, Germany, Italy and almost every other country in Europe it is one of the national beverages, and almost every household has its coffee mill. In this country

An excellent example of Hungarian moulded plastics.

we have never been able to secure a good cup of coffee, other than in the more expensive restaurants or in the homes of foreigners. The coffee mill must be the rarest of household goods here. It seems strange that those whose business it is to sell coffee have never made an attempt to make this country "coffee conscious." The only way they have of improving the economics of the coffee situation in Brazil is to burn thousands of tons to waste!

We fear the plastics industry will never be able to make coffee mills for this country until some radical change in our taste does take place.

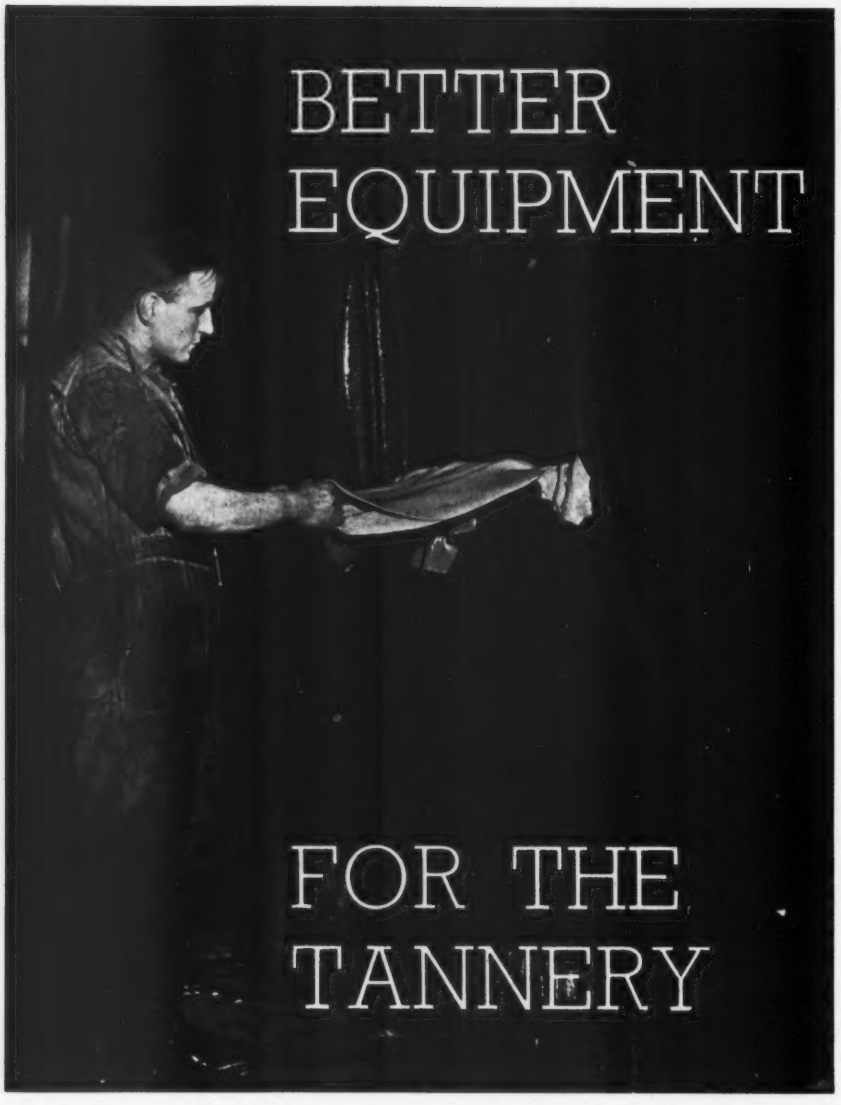
When a Tin is Not a Tin.

Yet another German effort at eliminating metals she does not produce within the country is reported in the production by a German canning company of "tin" cans made partly of cellulose acetate. The bodies are made of this plastic, while the top and bottom are of tin-plate. A new technique of joining acetate to tin-plate has been evolved, resulting in the production of what is virtually a transparent plastic bottle.

Cellulose Acetate Helps the American Shoemaker.

The replacement of metal and fibre patterns for cutting out boots and shoes, by an entirely new type made of transparent cellulose acetate with the guiding edge bound with metal to prevent the knife from slipping and damaging the pattern, is now receiving attention by American manufacturers. It is claimed that with the new pattern it is possible to match leather grains for different parts of the shoe and to avoid blemishes in the skin without lifting or moving the pattern in any way. Fitting and lasting margins are indicated on the patterns by means of engraved lines filled in with coloured inks and sizes are printed on.

Patterns are being made in the States through a licence arrangement with Messrs. J. J. Albrecht and Son, who have perfected the Da-Lite shoe pattern.



HOW PLASTICS CAN HELP

MOST of the improvements in the leather trade during the present century have been made in the field of chemistry, and to-day tanning has become largely a chemical process. In spite, however, of the many advances made in technical science, the leather industry has for many years now lagged far behind practically all others in the development and modernization of mechanical equipment. As the industry stands to-day it is no exaggeration to say it most urgently needs a good spring cleaning, which will entail wholesale replacement of derelict or inefficient plant. It is a sad but accepted axiom in a number of small works that a machine is satisfactory until it practically falls to pieces through old age or neglect.

The bulk of the equipment at present used in the tannery is made of wood, usually pitch pine, and this is about the most suitable material that could be found for building paddles, drums, lining pits and making other specialized pieces of equipment. Next to wood in importance comes iron, and in its unprotected condition it is totally unfitted for use in the tannery. In the first place, practically all tannery liquors are corrosive and soon corrode and eventually destroy ironwork. Then again, iron salts stain leather very badly, and although those stains can afterwards be removed by a clearing process using sulphuric acid, this extra operation is expensive and has a deleterious action on the delicate skin fibres.

Although at first sight it might appear that plastics can be of little assistance to the tanner, a knowledge of their properties coupled with a sympathetic understanding of the problems encountered in leather manufacture, make one realize that for many purposes they are in every way suitable. With the exception of one or two of the early operations where weak alkalies are used, practically all the solutions employed in tanning, dyeing and finishing are acidic in nature, and, as most technical men know by this time, the phenol formaldehyde range of resins, to mention only one, affords the most complete resistance to attack by both mineral and organic acids in the concentration found in tanneries and dyeworks.

Turning to practical suggestions for the use of plastics in the tannery, their most obvious application is to

afford a protective coating to all exposed metal parts of such machines as unhairing, fleshing, striking out, setting and shaving machines, all of which come in contact with wet goods, either in the pelt state or when tanned. Paint, even the finest and most expensive type, is of very little use, and the only really satisfactory protective medium is a synthetic varnish, such as is used in the chemical industries to protect metal plant against the corrosive action of gases and vapours. Although phenol formaldehyde varnishes are, perhaps, the best known, and, indeed, the most suitable as regards resistance to acids, the vinyl resins should prove very serviceable in the tannery. When applied to metal they form strong, tough films, which are highly resistant to alkalies, alcohol, grease, water and corrosive agents. What should be of particular interest to the tanner is the fact that vinyl resins are very suitable for use on cement surfaces, and prevent the lime from seeping into the liquors. There is no reason why concrete tan pits should not be permanently sealed with these new synthetic materials. Acrylic resins are also of interest in this connection and they have excellent adhesion to most surfaces, particularly metal.

Where a thin surface coating is not likely to give all the protection necessary, then the tanner might advisably use a rubber-coated metal surface. There are a number of firms specializing in chemical rubbers, and the bonded material possesses high strength and unequalled resistance to corrosion. Where special rubbers should be particularly useful is for treating the galvanized roof of the drying sheds. During certain times of the year, trouble in the form of ugly iron stains on the dried leather is encountered, due to condensation from the metal roof. The drops of condensed water contain minute quantities of dissolved iron salts, which cause the damage.

So far moulded equipment has found little, if any, use in the tannery, and yet phenolic-asbestos equipment made of Haveg or Keebush is ideal for many leather processes. Tanks, cylindrical and rectangular, can be moulded of this material, and it can also be used for making pipes and fittings of various kinds. This phenolic resin is unaffected by all the chemicals used in the tannery, including chrome salts, and can withstand temperatures up to 265 degrees F. It might be pointed out that the range of temperatures employed in the production of leather is from 50 degrees F. to 130 degrees F.

Laminated material—that is, paper or fabric impregnated with phenol formaldehyde resin—is also a promising material for the tannery. It can be machined as easily as metal and yet is unaffected by most acids, alkalies and chemical fumes, as well as oils and water. Gear wheels, fan blades and other accessories may be made of this laminated form of plastics, which although lighter than metal is able to give a performance comparable to some of the finest and most expensive alloys. Pumps used in sole leather tanneries for changing tan

(Left) Cold pressing leather for shoe linings. All the exposed metal parts of this machine could be protected by means of a resin varnish.

Spraying leather with a nitro-cellulose lacquer. It is suggested that acrylic ester compositions offer many advantages for finishing.

liquors from one pit to another frequently give a good deal of trouble owing to the corrosion of the metal rotor. Here is quite a simple way in which plastics can help. Experience in the chemical and electro-plating industries has shown that by replacing the metal rotor by one made of a suitable grade of laminated material, it is possible to prolong the working life of the pump a hundredfold.

In some tanneries the dyed or dressed skins are no longer tacked out on straining boards, but toggled on special metal frames. This method is recommended for several reasons, the first being quicker drying, and the second slightly greater area of leather. It has been remarked by some tanners that the toggles, although often made of special alloys, stain the leather as well as the workmen's hands. To overcome this disadvantage and also to reduce the rather high price of these frame-dyers, it seems quite a practical suggestion to use moulded toggles and soft rubber or ebonite-covered frames to hold the wire mesh.

Plastics find their main use in the leather industry in the form of finishes, and nitro-cellulose lacquers have been used now for several years and find a ready application, especially where a fast finish is required. An important development in leather finishes which is likely to become better known is the use of acrylic ester polymers. Their main advantages are their excellent powers of adhesion and permanent flexibility. The amino resins are also worthy of attention, and certain grades of lacquer made from these materials appear to be very suitable for finishing patent leather intended for shoe uppers. The physical properties of the surface coating are excellent, and appearance of the film is quite satisfactory.

ARMORIAL BEARINGS IN PLASTICS

Example of a high-relief heraldic device produced in plastics. The motto might well apply to this unusual and eminently successful application.

Messrs. M. J. Parkhouse, Ltd., are responsible for this coat of arms in plastics which is a fair example of about fifty other designs recently produced.

AT first sight it might seem that the demand for coats of arms and heraldic devices would be practically confined to those distinguished entries in Burke's Peerage. On inquiry, however, it is found that the work of the College of Arms is by no means confined to the peerage, and that coats of arms hang or are displayed in many other places besides baronial halls. Most large schools, colleges and universities boast their own heraldic devices, and in addition there are the regimental badges of the British Army, ships' badges of the Royal Navy, as well as numerous coats of arms displayed by business houses, by special permission of their illustrious clients.

Originals and reproductions of institutions, civil and private armorial bearings, as well as all kinds of heraldic work, are now being moulded of plastic material. M. J. Parkhouse, Ltd., have for some years now specialized in this intricate work, and their high-relief reproductions are made from Holite and formulated on a 50-ton Finney press. Naturally, the difficulties in obtaining the necessary high relief are considerable, and this long-experienced firm admits that it was only by the use of suitable plastic material that they were able to achieve good results within the necessary limits of price for small-quantity reproduction.

Although the accuracy of the high relief of heraldic motifs is of the utmost importance, there is also the question of colouring to be considered. To achieve success in this direction a considerable amount of handwork is necessary, as not only must fidelity of colouring be assured, but the finish also must be perfect.

Rubber on the "Mauretania"

The swimming pool on this new 33,000-ton liner is to have the walls and flooring of glass tiles laid on rubber, with the surrounding balustrades and pillars encased in gold quartzite.

Rubber from Tomato Skins

According to the *Corriere della Sera*, a well-known Italian chemist, Dr. Mauri, of Parma, has succeeded in making a form of rubber from tomato skins. The experiments of Dr. Mauri have been recognized by the National Research Council. It is estimated that from the skins of 8,000,000 quintals of tomatoes produced in Italy every year it will be possible to manufacture 20,000 quintals of the new rubber composition.

World's Strongest Diving Suit

Mr. M. E. Nohl, of Milwaukee, U.S.A., who is holder of the world's diving record, descended to a depth of 420 ft. wearing a suit made mostly of rubber. Collard, Inc., of Detroit, are the manufacturers of this greatly improved diving suit, and they used a canvas foundation upon which was deposited a thick coating of rubber. This measured $\frac{1}{16}$ in. on the inside and $\frac{1}{8}$ in. thick on the outside, graduated to $\frac{1}{4}$ in. on the shoulders and neck.

Leatherlike Rubber

According to a report from Paris, a method has just been perfected for manufacturing a special leatherlike rubber, which, while retaining the excellent water-resisting qualities of ordinary rubber, is superior to the latter in appearances and more comfortable when used for clothing and footwear. The leatherlike effect is obtained by impregnating or coating a fabric material with latex and then immersing it for 20 seconds in a solution made up of sulphur chloride and benzine. After drying in the open air the material is soaked in water for two hours. It is claimed that this new rubberized material has all the appearance, feel and properties of leather and can stand up to reasonable high temperatures without softening or suffering damage.

Goloshes for Cattle

The Bata shoe concern in Czechoslovakia have found that cattle can be afforded protection against certain hoof diseases by wearing specially designed rubber goloshes. A large number of these are now being produced at the company's main works.

Rubber Reduces Crockery Breakages

An ingenious and really practical sink protector, which fits over the rim of the sink, is now made by Redferns Rubber Works, Ltd., Hyde, Cheshire. It acts as a guard to the sink and also prevents accidental damage to crockery when washing up.

New Rubber Wall Panels

The Goodyear Tyre and Rubber Co., Akron, Ohio, U.S.A., are now making a decorative and permanent rubber wall covering, which is known as Wingfoot Wall Rubber. It is available in sheets $\frac{1}{16}$ in. thick and has a fabric backing which, with a special cement, adheres perfectly to all wall surfaces. Panelling is made in a wide range of attractive colours.

Latex Coated Seeds

By giving seeds a very thin coating of specially prepared latex containing small quantities of fertilizers and fungicides to kill parasites and bacteria, it is claimed that a greater yield, better germination, earlier growth and fewer operations in crop growing are obtained. The latex covering is able to allow both moisture and air to penetrate to the seed.

For the Photographer

The Altrincham Rubber Co. are now making several moderately priced rubber photographic accessories. One of their most popular lines is the A.R.C. Lens Shade, moulded of black rubber which can be slipped into the pocket without causing any unsightly bulge. A set of rubber shoes to prevent a tripod slipping on a polished floor, also finger stalls for those who do their own developing, are other useful accessories.

The workshops of Nordac, Ltd., showing rubber cutting and laying and at back a large vulcanizing chamber.

Lining Steel Plant with Rubber

THE man in the street, naturally enough, usually thinks of rubber as a raw material merely in terms of shoes, hose-pipe, gloves, golf balls, flooring and waterproof coats, where its hard-wearing properties, elasticity, impermeability to water make it essential.

But there are walks of life, especially industrial life, where the use of rubber is hidden from the gaze of the ordinary public, but is of such vital importance as often to make the difference between economic failure and success. In such instances we have present extraordinary cases of corrosion or erosion.

Ordinary steel as a material of construction undergoes corrosion in ordinary air, this corrosion being attack by the gases of the atmosphere, such as oxygen and carbon dioxide and water vapour. The result is a slow but sure rusting away and eventual disintegration of the structure with time. If the steel, instead of being merely exposed to the air, is immersed in sand by the seashore, we have not only a condition of corrosion by air and sea water, but also abrasion or erosion by the continual action of the sand; in other words, a purely mechanical wearing.

Now imagine either of these actions taking place at a greatly increased speed, say at 100 times the speed they take place in the air or by the sea. It is obvious that economically we could not afford to have steel exposed. We must protect it.

What are these extraordinary cases in industry where abrasion or erosion and corrosion are so speeded up? Excessive abrasion occurs chiefly in the mining or ore-treating industries, where, for example, thousands of tons of iron ore or coal per day are transported through chutes or on belts. The continual rubbing of such hard materials against even the toughest of steels would soon destroy them.

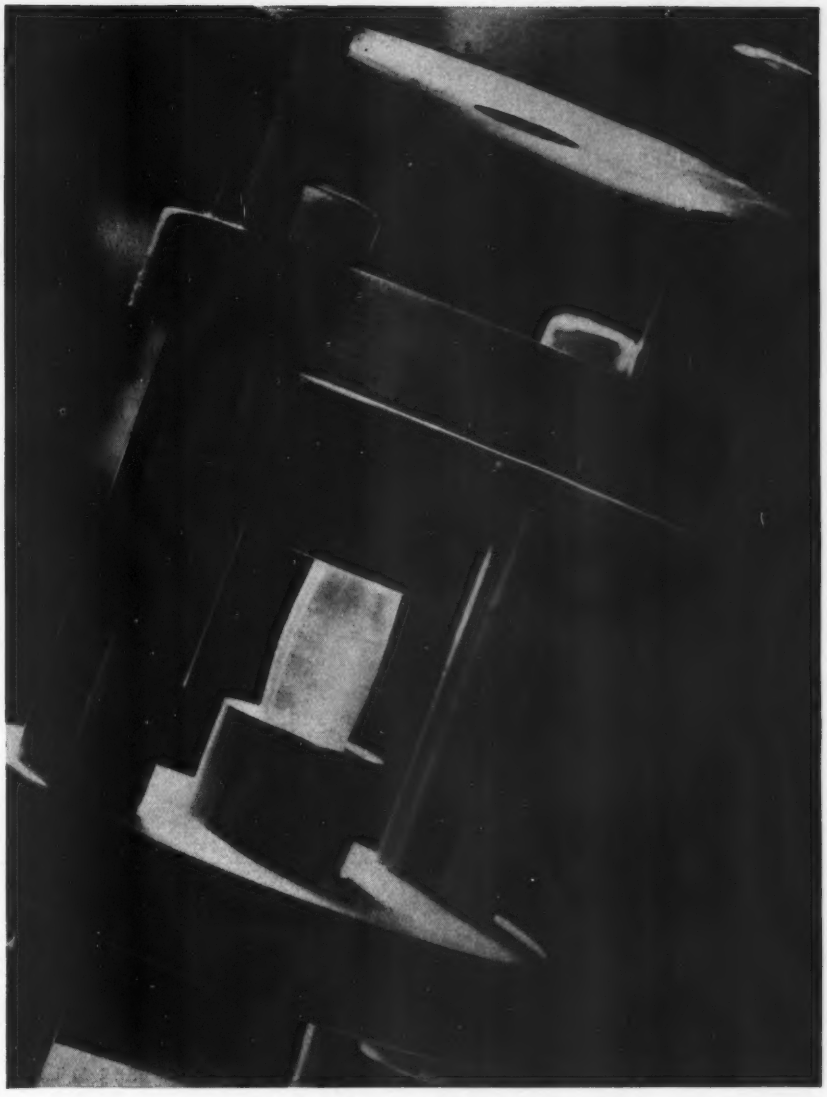
The greatest speed of corrosion occurs obviously in chemical works or in industries when chemical processes are the routine. Here the chief cause of corrosion is the action of chemicals such as acids, which attack most metals extremely rapidly.

In comparatively recent years both problems of protecting iron and steel against these two enemies, abrasion and corrosion, have often been solved by the utilization of a rubber layer applied so as to adhere closely to the metal and, indeed, to form almost one with it. As a protection against abrasion, chutes and channels lined with soft rubber provide greater resistance than any other material, and lengthen the life of such plant many fold.

As an example of the use of rubber in chemical factories, we may cite the case of a works that employs hydrochloric acid for, let us say, the production of nickel chloride for electro-plating purposes. Now since large quantities of the acid are used, it must be stored properly in a tank. Such a tank could be made from wood or earthenware, but even the hardest of woods will disintegrate with time and leak, while the earthenware storage tank, although admirable in its resistance to acid, is often impossible to employ owing to ease of damage and breakage. Steel alone is, of course, out of the question. The best method would be a wooden or steel tank lined inside and, if necessary, outside with rubber. Within there would be formed a perfectly impervious sheet, through which no liquid could pass and, moreover, the acid would have no corrosive effect on it. Thus the tank or vat itself is completely protected, its life being prolonged to that of the rubber lining.

The technique of lining plant with rubber sheet, which may be required soft or hard in the finished condition and may vary in thickness from $\frac{1}{32}$ in. to $\frac{1}{4}$ in., has only been developed in the last 15 years or so. Moreover, there is the added complication that many jobs must be carried out on the site of the chemical

Measurement of compression strength. The compressed rod is just beginning to yield by bulging.



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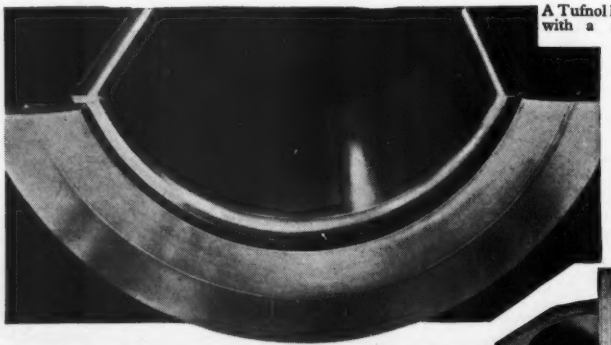

A Tufnol liner or shell with a thrust-ring.

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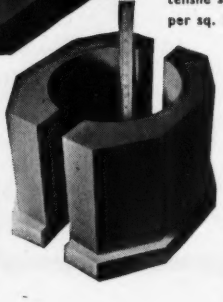


A pair of Tufnol solid bearing blocks machined to the same shape and size as the metal bearings they replaced.

89

Sandblasting prior to covering with rubber.

Lining and welding rubber in a 16-ft. pipe.

works itself, for it is not often feasible to remove existing plant. Special methods, therefore, very different from those normally carried out in ordinary rubber works, must be employed, especially when it is realized that rubber will not adhere to wet or dirty surfaces and that steel is usually wet and rusty, timber often sodden, and concrete wet and porous.

It was, therefore, with considerable pleasure that we were able to visit the new factory of Nordac, Ltd., of Duke's Road, Western Avenue, London, where the various processes were explained to us. This concern, under the leadership of Mr. Norman Swindin, M.I.Chem.E., was one of the first to tackle the new problems involved in this important section of chemical engineering.

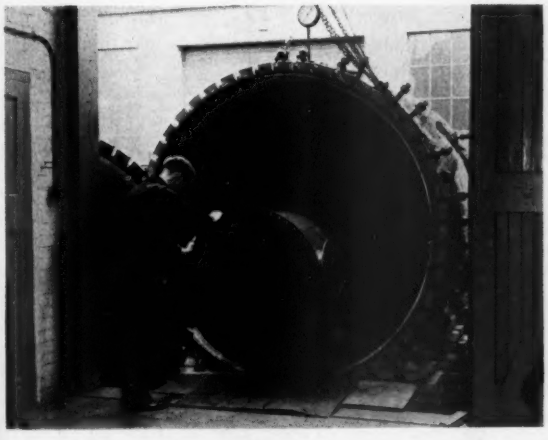
The Technique of Rubber Lining

As we have already pointed out, the processes here described are so new that special methods of application different from the usual rubber practice have had to be devised. Of first importance is the method of adhesion between the rubber surface and that of the steel, wood or concrete, etc. Chemical research has now resulted in the formulation of special cements which can be applied to almost any type of surface with very satisfactory results. These cements are plastered and rendered on the surfaces, so that when dry a good bed to which rubber can be applied is thus formed. Moreover, these cements have excellent adhesion to wet and even dirty surfaces.

We shall first deal with the work carried out at Duke's Road, namely, the rubber lining of such plant which can be transported there for treatment, as distinct from that type of lining which must be carried out *in situ;* that is, in the works of the customer.

Since it is far easier to attach rubber to a clean surface, the preliminary treatment is the sandblasting of the metal, so that not only is rust and other dirt removed, but a good key for the cement is first formed. The accompanying photograph shows the sandblasting plant and the cleaning of a fan prior to covering with rubber. It is interesting to note that the fan is being covered, not as an anti-corrosion precaution, but to resist abrasion. It will form part of a plant for the extraction of sand-laden air. We were informed that without the rubber covering the life of a fan would be about three months. Similar fans covered in rubber, and under exactly the same conditions, have already lasted 18 months.

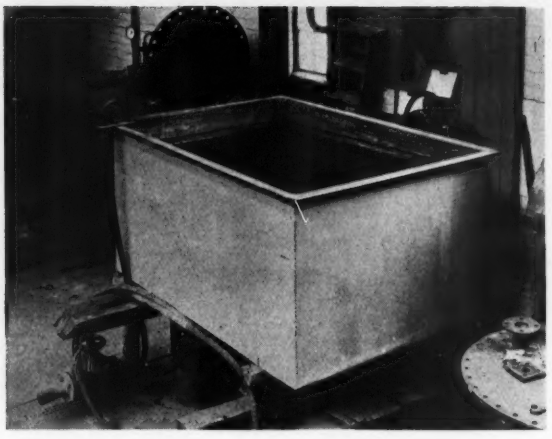
Special cement is then plastered on to the cleaned



Loading a lined tower into a large vulcanizer.

Testing the completed job for leaks.

Scrubber for cleaning gases.



A waste acid storage tank.

surfaces, and when dry unvulcanized sheet rubber cut into the requisite shape is formed and pressed into position. It will be understood that the jointing of sheets is important and frequent, and ordinary rubber solution is not suitable for the purpose. To ensure tightness and perfect homogeneity, a real weld between two edges is obtained by the use of hot iron rollers. It will be realized that according to whether soft or hard rubber linings are required, so is the quality of the sheet varied. Also the method of cementing an ebonite layer to iron or steel is different from the method of attaching soft rubber. For ebonite, an entirely new process of adhesion termed the Vulcoferran process is now carried out here.

The next process consists of the final vulcanization of the rubber. This consists in the application of heat to convert the "uncured" material to its tough final form, which may be either soft rubber or hard ebonite. The vulcanizer consists in essence of a large pressure vessel or tank, which can be hermetically sealed once the rubber-lined plant is introduced therein. Direct steam at 57 lb. per sq. in. is then introduced, so that the temperature rises as required. There are several of the vulcanizers in the works, the largest being 7 ft. in diameter and 14 ft. long, so that large vessels can be treated. For soft rubber the treatment is carried out at 135 degrees C. for 40 minutes, while for hard rubber the temperature is 150 degrees C. for four hours.

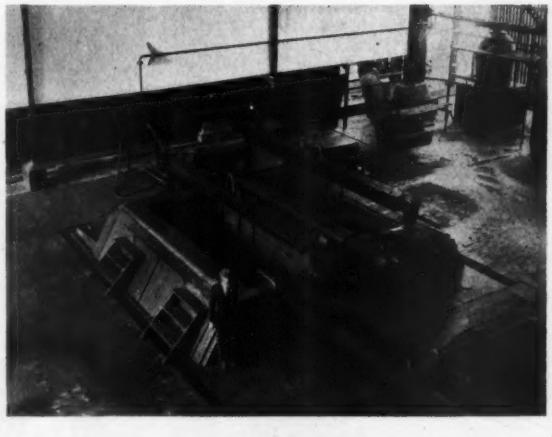
When removed the rubber is completely vulcanized and literally forms one with the basic structure. It is also interesting to note that the fact that the lining is of rubber, allows for an excellent method of testing for leaks and other defects of workmanship. Each piece of plant is tested by means of a high-tension induction coil (using 20,000 volts). The slightest crack or leak is detected by the formation of a spark jumping from the metal strip held in the hand to the metal base.

Reference was made earlier to the lining of chemical plant *in situ*, and it will be obvious that many of the processes carried out at the Duke's Road works cannot be carried out "away." Thus sandblasting is generally impossible, and vulcanizing according to the above process equally cannot be done, since the job of lining may refer to a concrete or iron tank 20 ft. long sunk into the ground. New methods have again been adopted. Special cements which can adhere to wet or even rusty surfaces have been so devised as to form a union almost impossible to separate. Again, after the rubber sheets have been cemented to the structure, vulcanization is carried out by admitting boiling water into the vessel.

The type of work carried out by Nordac, Ltd., is extremely varied. We reproduce some photographs we were able to obtain of much interesting plant. Among these will be noted a complicated gas scrubber for cleaning gas containing dilute acid vapours. Here the vessel contained a number of fans, 12 in number, and each constructed of six blades. Each of these and the inside of the tank which carried the washing liquor were covered with soft rubber.

Another interesting piece of plant is the waste acid storage tank made for sewage treatment. Rubber lined, it is also fitted with an air-lift for feeding a neutralizing tank at the low rate of 7 gallons per hour.

Special attention should be drawn also to the "pickling" tank at one of the works of Dorman, Long. "Pickling" is the process of cleaning steel sheet in hydrochloric acid prior to dipping in molten zinc for galvanizing. This "pickling" tank is of concrete and was lined *in situ* with special rubber cement, then with ¼-in. thick acid-resisting rubber, and further protected with acid-resisting brick.



A modern pickling plant at Dorman, Long and Co., Ltd.

"Spot-Welded"——

Cellulose Tape Increases Eye Appeal

ONE of the most successful methods of sealing various types of packages in the food, confectionery and pharmaceutical trades is with self-adhesive cellulose tape, which consists of a patent adhesive of a non-drying type coated upon a backing of "Cellophane." This is supplied fully transparent or in a variety of glossy, opaque colours which are most likely to brighten up packages and make them more attractive.

One important practical feature of this self-adhesive tape is that it immediately sticks to any clean, dry surface by light finger pressure, no gum or water being required. Not only is the tape itself designed for convenience and rapidity of use, but it is most economical because the large amount of overlap of wrapping material necessary when packages are not sealed can be cut down and the appearance of the wrapper improved.

Experience has shown that, when using this new cellulose tape, sealing operations can be speeded up on all kinds of "Cellophane" or glassine wrappers and the use of messy and slow-drying gums and glues avoided. Then not only does sealing become a neater and quicker operation, but a far more effective seal is ensured which, in the case of food products, keeps them fresh for a longer period.

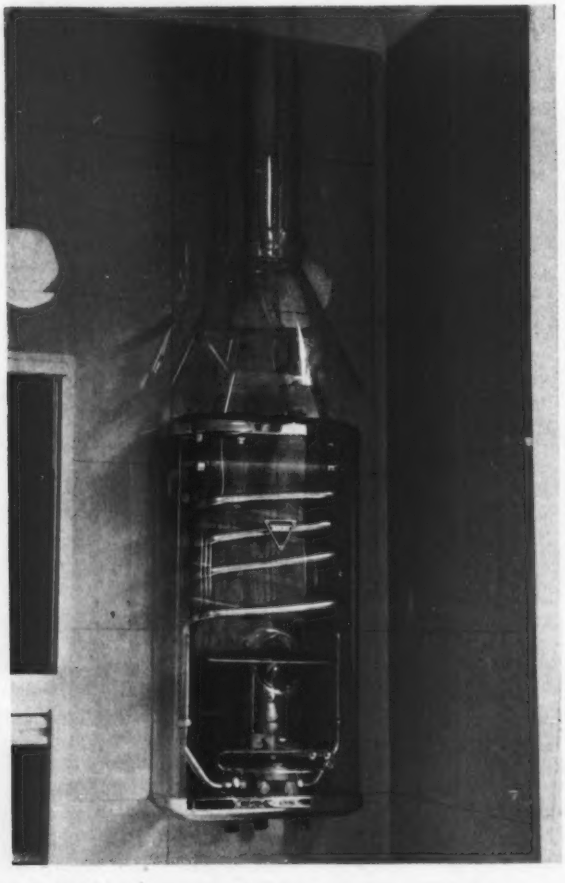
The modern method of packing confectionery is not only hygienic but attractive looking. The self-adhesive cellulose tape used for sealing is efficient without being obtrusive.

Although it is in the bakery and confectionery trades that cellulose tape finds its most important use, manufacturers of toilet preparations are also finding coloured tapes of great assistance in providing an adequate sealing medium of an efficient and attractive nature.

Packages of irregular and awkward shapes, such as speciality lines for Easter and Christmas sales, can be sealed most effectively with a strip of this tape, and it has proved ideal for combining together two or more articles to form an introductory free offer. Its transparency permits perfect visibility of printed matter on the packages and furnishes a positive seal which can save the cost of a separate carton.

Quite apart from its proved utility as a sealing tape, many other uses for self-adhesive cellulose tape are continually being found. It is used extensively as a decorative binding by manufacturers of tennis rackets, golf clubs and other sports equipment. Window-display specialists have found it invaluable for building up striking and original creations and obtained effects which would have proved extremely difficult to achieve with ordinary adhesives. Manufacturers of electrical equipment use it for binding and identifying cables by means of the coloured tapes, and offices, banks, schools and libraries have found the transparent tape ideal for mending torn currency, book pages and blue prints.

SEEING IS BELIEVING



The Ascot heater used for sales campaigns, with casing and flues of Perspex.

MANKIND has an insatiable appetite for seeing the inside of things and the manner in which they work, for mankind is now much more mechanical minded than he has ever been. Put a model of a railway engine or even merely of a pump in section in a shop window and the noses of a thousand sightseers will rub against it all day.

The idea is, of course, not new, and some concerns have, in the past, shown full-size jobs with metal coverings cut away at vital points to show the inside. As a method of teaching what happens inside the machine it cannot be beaten—consequently it becomes a powerful weapon in advertising.

There is, however, one objection to this process. It is expensive, for the usual casing must be made and cut away. The modern method—and here plastics comes into its very own—has even much greater attraction, for we are now able to see within without the necessity of cutting. It is not merely the illusion of seeing within—we are able actually to do so.

Our readers will doubtless remember the Hillman Minx that was exhibited at the last Motor Show. Here the vital parts were covered with transparent plastic sheet, that showed clearly what happens when you put the brake on, when you double-declutch and what baggage space there is available. It was one of the best means of advertising this car we have yet seen and deservedly collected huge crowds.

Another excellent example of this type was that shown at the Berlin Motor Show this year and depicted in our March issue on p. 102. It showed a complete motor engine which, with the exception of the metal cylinders, was made of transparent plastics. It is, perhaps, reasonable to expect that the motorcar factories with advanced ideas of advertisement (and some spare money), would be the first to adopt "transparency" as an advertising medium.

However, that is not the end of the story by any means, for now we leave the motor industry for another which has wisely learnt from it and has adopted similar methods.

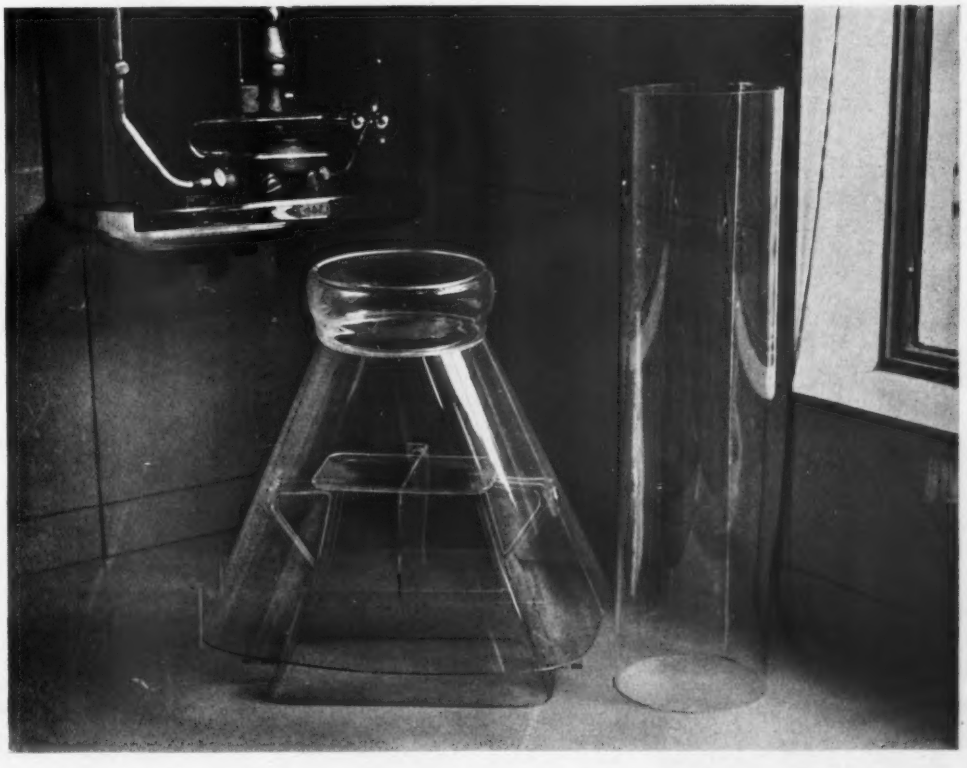
We were amongst several hundreds that rubbed our noses in ecstasy against a window behind which was exposed the most recent model brought out by Ascot Gas Water Heaters, Ltd., for exhibition purposes, and, by editorial guile behind the scenes, we were able to get the accompanying photographs and obtain sundry details.

Here we are not only able to "see the works," but the Ascot heater assumes greater beauty than ever. By its means the manufacturing concern can now carry out with simplicity one of the most necessary campaigns that aid sales, viz., teaching the housewife how simply and efficiently water is heated in an Ascot heater, and where, as the Ascot people say, it is an improvement over other types. So valuable is this method considered that Ascot Gas Water Heaters, Ltd., intend installing several for teaching their salesmen.

The transparent plastic used here is Perspex, the now famous "acrylic" resin made by I.C.I., Ltd. As will be seen, the entire casing and flues are made of this material, which can be worked by hand into complicated shape. The merit for the beautiful work done in this instance goes to Triplex, Ltd.

Viscose sheet, celluloid and transparent cellulose acetate are often employed in advertising displays. Their use is so common now that comment is rare, but an amusing display at a recent exhibition that attracted our attention was that of Electrolux, Ltd. Here two gigantic water taps were shown with water "flowing" from them. As will be seen from the accompanying photograph, the tap on the left contained water which was untreated—as hard as nails. This "water" was a cylinder of cellulose acetate into which had been stuck a large number of rusty iron nails.

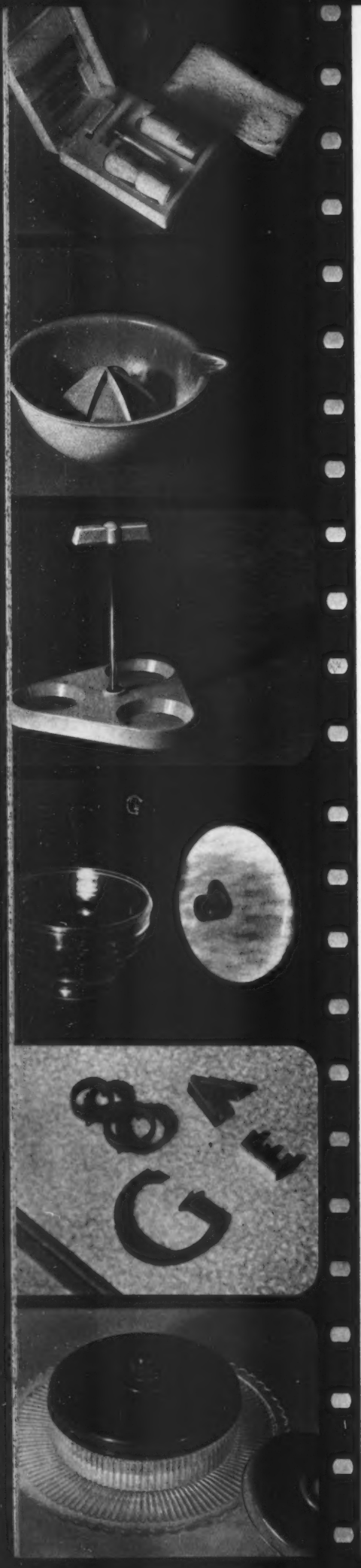
A novel use of cellulose acetate.



Close-up view of the flue and chimney of the exhibition Ascot heater.

"General Release"—I

New and Interesting Plastic Goods



SHAVING sets are now designed for appearance as well as efficiency, and the latest production of British Xylonite, Ltd., certainly leaves nothing to be desired in this respect. The set illustrated is provided with a Xylonite case and contains a shaving brush, soap, razor and blades, also a moulded blade box and razor towel. There is a handy detachable metal mirror fixed to the inside of the lid, which should prove very serviceable.

SEEN at the recent Ideal Home Exhibition, this useful lemon grater and squeezer moulded of amino resin moulding powder has the grating device in the base, consisting of six rows of stainless metal teeth. It is thus possible to prepare grated orange or lemon peel before squeezing out the juice. This device is moulded by H. E. Ashdown (Birmingham), Ltd., for Monolines, Ltd.

ONE of the most interesting plastic exhibits in the food section at the Ideal Home Exhibition was the plastic pickle cruet moulded in coloured Scarab by the Streetly Manufacturing Co., Ltd., for John Burgess and Son, Ltd., London. The tray and handle are connected by an upright chromium-plated rod, and the moulded portions are available in green, yellow and red.

A NOVEL and interesting combination of Diakon for the powder bowl and Xylonite for the lid has made possible this attractive Halex dressing-table accessory. The bowl is fully transparent, but the lid is available in a number of attractive colours, including tortoise-shell, blue, green and pink. British Xylonite, Ltd., are the manufacturers.

THESE intricate hand-carved letters show the ready adaptability of modern cast resins and casein. Dale's, of Brighton, are responsible for these examples, which find ready use for shop signs and general display work.

THESE neat and attractively designed Beetle jam covers moulded by the Streetly Manufacturing Co., Ltd., are now on sale at the multiple stores and in constant demand. After the waxed paper covering has been removed from the jam pot these tight-fitting moulded caps afford full protection.

"General Release"—II

New and Interesting Plastic Goods

THIS neat and attractive paper towel cabinet was designed by Consultants, Ltd., for Cresco, Ltd., of Slough, Bucks, and moulded by British Xylonite, Ltd. The Cresco service provides for the supply of cabinets free on loan for an initial order of three dozen towels. A clean towel costs only one-tenth of a penny.

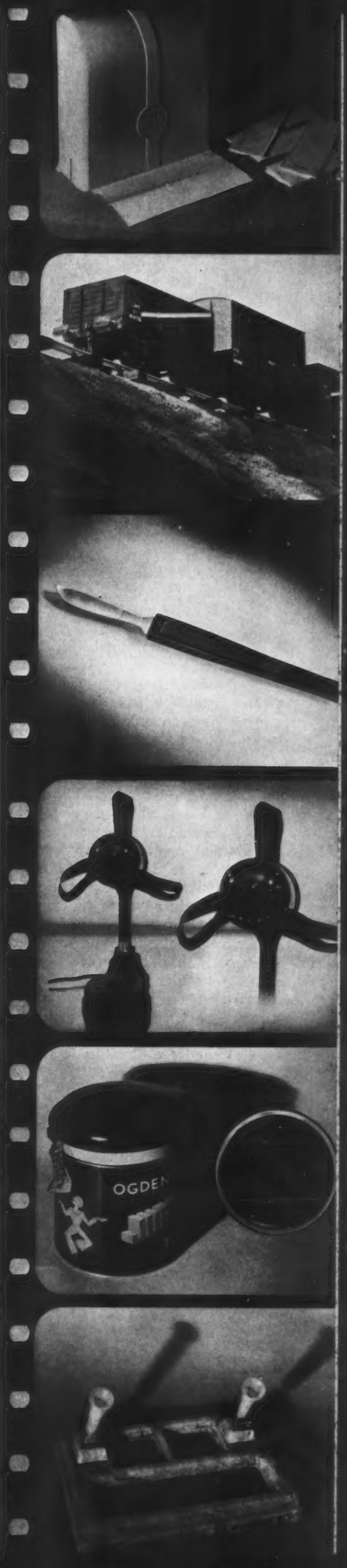
SO realistic do these railway wagons appear that unless the photograph is very closely examined it is almost impossible to detect that they are models. Yet it is a fact that these miniature wagons, which measure only a few inches, are moulded of Scarab by the Leeds Model Co., Ltd., and look like being best sellers in the toy trade.

THE Clay-Adams Co., New York City, has recently created a new, well-balanced dissecting scalpel, which is made with a lustrous black Bakelite moulded handle. The handle is designed so as to provide a firm finger grip. It is criss-cross embossed to prevent slipping in the fingers when wet. The company states that in employing moulded plastics for the scalpel, the handle is not likely to swell or split when wet.

THE "Bandolero" electric fan is moulded almost entirely of phenol formaldehyde resin. It is designed for home use and is manufactured by the Hot Point Electric Appliance Co., Ltd. The blades are made of Petersham braid, which, unlike those cut out of sheet metal, cannot possibly inflict any damage when accidentally touched. The moulded body of the fan renders the appliance completely insulated and shock-proof.

THE "Clamp-tite" tin, made by the Metal Box Co., Ltd., has been evolved by Ogden's for the retailer to store certain brands of their popular-priced packed tobacco. The tin, which holds 1 lb. of tobacco, is provided with a specially designed moulded lid of phenol resin, which when closed renders the tin moisture and atmosphere proof.

COMBINING colour with utility, this inkstand made of Permastic shows to excellent advantage the artistic and practical possibilities of this well-known cast phenolic resin manufactured by Permaplastic, Ltd., 1, London Wall Buildings, E.C.2.



Phenol-formaldehyde Mouldings for Electrical Purposes

By E. E. Halls

THE facility with which phenol-aldehyde synthetic resins can be converted into hard, infusible solids, allied with their binding properties, naturally suggested their adaptability for moulding processes. Alone, the pure moulded resin proved too brittle as well as too expensive for general purposes, and the problem of finding a suitable filler to offset these drawbacks was rapidly overcome. Wood flour on account of its accessibility, low price and ease of incorporation in the mix rendered it acceptable as a raw material, while strength, appearance and density of the moulded product caused it to be favoured from the viewpoint of the finished article. The bulk of mouldings to-day, therefore, employ wood flour as the filler base, while additionally colourants and pigments can be uniformly incorporated to provide any required colour or variegated pattern. For special purposes other fillers can be utilized. Thus textile flock to promote greater resistance to shock stresses, asbestos to provide increased resistance to burning, mineral fillers, such as mica dust, to yield greater stability from the viewpoint of dimensional changes under conditions of heat or moisture, and likewise for the provision of improved electrical characteristics, are the outstanding groups.

The outstanding feature of moulded products centres in the reproducibility of dimensions and profile, so that shapes which are complicated for machining, or which would entail expensive or numerous individual machining operations, are produced rapidly in bulk quantities at relatively low cost. Moreover, no expense is entailed by the user in finishing operations, for they are produced from the mould usually with a high gloss, but matted if desired, clean and of correct colour shade, so that no artistic or protective finish is required.

Moulding practice comprises the loading of the powder into a mould of suitable design, and under the influence of heat and pressure converting it into a compact solid of the required shape. Moulds may be of different types, according to the nature of the article and the quantity to be produced. Impressions in the mould are produced by machining or by building up in sections; or in the case of many multiple moulds, impressions are produced by hobbing, followed by the necessary clean-up machining. Case-hardening mild steel is used for multiple impression moulds and for many simple types, while larger moulds which have to withstand higher pressures are machined from heat-treated chrome-vanadium steel. A high polish is imparted to the surfaces of the impressions, and in many cases moulds are chromium plated to provide greater resistance to wear.

The design and surface finish of moulds, the pressures employed, and the duration of curing are all reflected in the moulding. The two first of these factors largely determine the surface appearance of the moulding and the amount of flash to be removed from the moulding at tool junctions, and therefore they have a vital bearing on cost of dressing the moulding and the extent of polishing it. The last two factors determine the stability of the moulding and its compactness or density. Even with all the care that can be given in the moulding process, "phenol" mouldings, in common with metal castings, hot pressings, etc., shrink on cooling, and therefore a tolerance on finished dimensions has to be allowed. This is commonly of the order of plus or minus 0.003 in. per inch. Furthermore, the distortion of sections, which are not adequately strengthened, during cooling after removal from tools must not be overlooked, and where necessary cooling off in jigs or on shrinkage blocks insisted upon for its prevention.

Fig. No. 1 shows a terminal block moulded from an ordinary pigmented wood flour "phenol" powder. It demonstrates the facility with which a multitude of small holes can be reproduced with accuracy to both position and dimensions, and, moreover, the small distortion resulting from the uneven section caused by the rows of larger holes adjacent to edges.

Fig. No. 2 shows a contact strip moulded from an ordinary black "phenol" moulding powder. It demon-

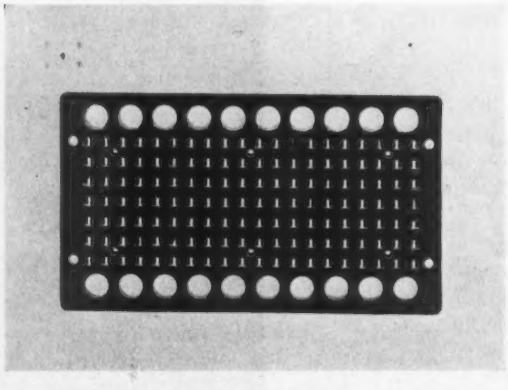


Fig. 1.—Terminal block showing mould accuracy.

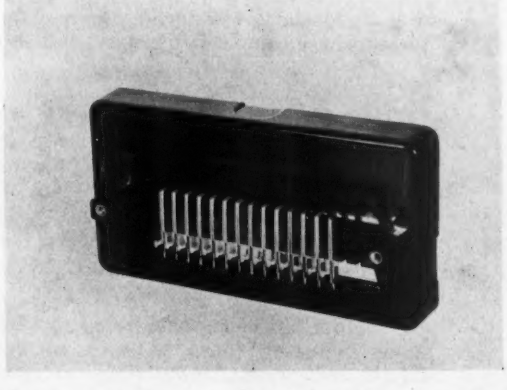


Fig. 2.—Contact strip of "phenol" resin powder.

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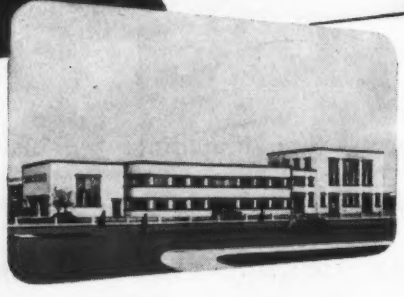

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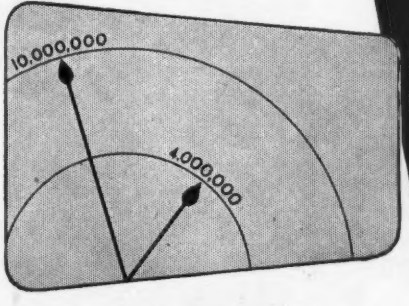

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strates the accuracy with which a number of small slots can be moulded for holding the contact springs firmly, and illustrates the marked economic saving from elimination of machining operations.

Fig. No. 3 shows a valve base moulded from a mica-filled "phenol" powder, in which internal and external diameters are important, and, moreover, the retention of a constant external diameter is of major moment. The photograph also shows some tiny mouldings in which profile is of extreme importance, but in which the machining of such profile would be difficult.

In many cases moulded "phenol" resin powder is not sufficiently strong to withstand the stresses involved in assembly fixings, and this weakness is overcome by moulding metal inserts in relevant positions. Again, for simplifying or cheapening subsequent assembly operations, nuts, screws, terminals, contact studs, etc., can be moulded in position, or alternatively suitably designed metal components can be force-fitted into position in appropriate recesses upon extraction of the article from the mould while still warm.

All classes of mouldings can be employed with utmost confidence that they are entirely free from corrosive tendencies under all conditions of atmospheric temperatures and humidity. Hence no troubles will occur at metal inserts or from coil windings applied directly to moulded formers due to corrosion or electrolytic action.

The popular "phenol" mouldings having a wood flour filler, although moisture absorbent, have absorption values that are small. They absorb appreciably less water than laminated paper or fabric boards, and for all general purposes they may be regarded as stable with respect to dimensional changes, weight changes, as well as with respect to electrical characteristics. Moreover, with the exception of the polystyrols and polyvinyls, they are markedly superior to other moulded plastics. Under the very severely accelerated conditions of complete water immersion for 21 days, the average weight increase will be of the order of 2½ per cent., and dimensional increase of the order of 0.25 per cent., while under conditions simulating tropical exposure

TABLE No. 1

Typical Mechanical Values for Phenol Aldehyde Resin Mouldings

Filler	Tensile Strength Tons/sq. in.	Compressive Strength Tons/sq. in.	Impact Strength Kgms./cm./cm².
Wood Flour ..	1½—3	10—16	1.5
Textile Flock ..	2—4	8—14	5—20
Asbestos	1½—3	10—16	1.0
Mineral	1½—3	12—18	1.0—1.5

(daily cycles hot/cold, wet/dry, 8 hours 50/55 degrees C. and 70 per cent. humidity, 16 hours 18/22 degrees C. and 100 per cent. humidity) for 21 days, the average weight increase is of the order of 0.8 per cent., and dimensional changes up to 0.2 per cent. The flock-filled varieties would behave similarly, but in the asbestos and mineral-filled types almost absolute stability can be obtained.

Relative to resistance to dry heat, similar remarks to those made under the heading of moisture absorption appertain. The mouldings are serviceable up to temperatures of 110 degrees C.; at 130 degrees C. they tend to blister unless heat-resisting mineral-filled grades are employed. In general applications, a maximum temperature of 70 degrees C. may be regarded as fully covering service requirements. Average weight loss upon exposure to 70 degrees C. for 21 days is 2.5 per cent., and dimensional shrinkage of the order of 0.4 per

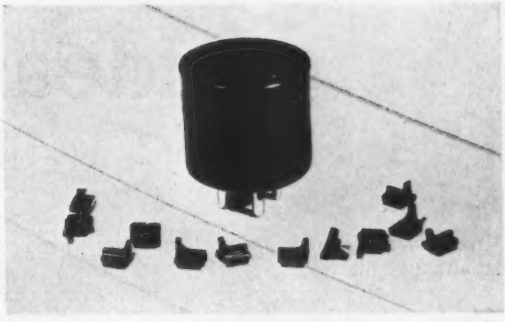


Fig. 3.—Valve base of mica-filled resin.

cent. Moulded plastics of other denominations behave markedly inferior to this, the polystyrols and vinyls failing under heat from distortion.

Black "phenol" mouldings are the most widely employed colour, and these are quite stable with respect to colour and gloss under exposure to strong light. Pale colour shades are not permanent, while dark colours may show the effect of "yellowing," particularly the greens. When colour is of prime importance, amino-plastics are employed.

Design of moulding largely determines its suitability from a strength point of view, apart from the intrinsic strength of the material itself. However, bearing in mind that the moulding comprises a mass of particles bonded together by a plastic matrix, the strength it displays is of high order. Typical values derived from test mouldings are given in Table No. 1, from which the distinctive character of the flock-filled mixtures is plainly evident.

Regarded from a purely machining outlook, these mouldings are not tractable. Usually, however, machining operations are confined to drilling and tapping processes, and the utilization of special drills and chromium-plated taps now available reduces the troubles at one time encountered. It should be mentioned that drilling operations are only involved when holes are too small to reproduce in the mould.

TABLE No. 2

Typical Electrical Values for Phenol Aldehyde Resin Mouldings

Filler	Electric Strength V.A.C./mil.		Power Factor per cent. at 800 cycles
	At 90°C.	At 20°C.	
Wood Flour ..	150/300	200/400	3 to 10
Textile Flock ..	100/200	200/350	8 to 20
Asbestos	50/200	100/300	5 to 15
Mineral	100/300	150/400	10 to 20*

* Special mineral filled moulding powders are available which, with pre-heating, low curing temperatures, and a final baking treatment, give a product of power factor less than 3.

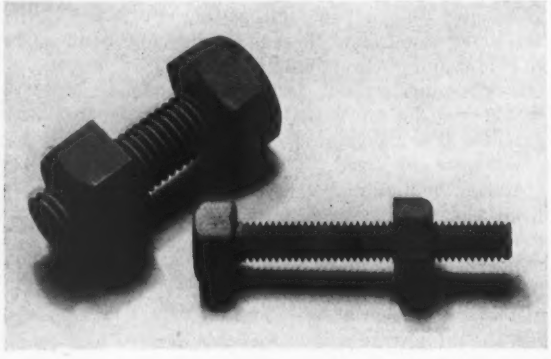
From the electrical characteristics given in Table No. 2 it will be seen that design of moulding can amply cater for all that is desired with respect to electric strength and insulation resistance. From the power and loss factor aspects, "phenol" mouldings do not compare favourably with the polystyrols and vinyls, but this only assumes importance in high-frequency applications in which special ceramics or polystyrols are used. Another shortcoming that it is only fair to indicate is the liability under certain circumstances to "tracking," but the applications in which this phenomenon is likely to occur are extremely few.

Ideas—

By the EDITOR

Plastic Screws

In our March issue, in answer to a reader, we indicated that although plastic screws could be made of laminated plastics, that the mechanical cutting would prove no easy task, and that we had not heard of anybody producing them yet. This is not the case, however, for Ellison Insulations, Ltd., send us some excellent examples of screws, nuts and bolts which they



have been making for some considerable time. Those we illustrate have been beautifully machined from rod. Other examples have been moulded for special purposes. The material from which they have been made is Tufnol, the laminated product for which Ellison Insulations, Ltd., are so well known. The bolts shown in the photograph are about one-half actual size.

Porous Pots

While poring through a recent list of patent abridgments, I came across B.P. 479,432, which deals with the production of pots for growing plants, a subject I have continually dealt with in these pages. But it goes a step farther in moulding the flower pot from a mixture of ordinary moulding powders and various water soluble salts. These latter salts can be washed out after the finished moulding is manufactured, the inventor claiming that thereby a porous pot is obtained. Also that the salts included may be plant-nutrients or materials for suppressing the growth of weeds, etc., so that if the salts are only partially washed out, not only is the pot a porous one, but it contains some plant nutrient. The latter point does not seem terribly exciting to me, as only a small amount of salt can be contained in a small pot, and also it would soon be washed out altogether. But this method of obtaining porosity is interesting, although I think it stands to reason that the finished pot would be weaker than a non-porous pot. Furthermore, as I have already pointed out, I am convinced that porosity is not essential for flower or plant pots. In fact, a great many made from glazed earthenware are on the market now.

On the other hand, the production of porosity in synthetic resin mouldings would seem to have other more important outlets, and the inventor refers to the manufacture of articles of plastic materials that have capillary channels through them, such as filters for gas masks, air purifying, diaphragms, heat insulators, etc.

Heads for Hatters

One of the outstanding exhibits at the B.I.F. was that shown in the accompanying photograph and exhibited at the stand of Catalin, Ltd. Cast from pure resin and in an amber colour, the head is a magnificent example of what can be made from this material. Solid and tough, yet with the clarity of glass, it makes an admirably attractive head for display purposes in men's-

wear shops. Now that cast resin has been made available by several firms, we shall expect to see in the near future some real attempts to make it a raw material for artistic production as distinct from the utilitarian.

Picture Hangers

A Brighton reader suggests, in view of the spreading modern habit of making picture frames in more vigorous colours, the production of coloured moulded picture hangers. This is such an obvious outlet that I should have thought they were already on the market in some form, although perhaps not in the ordinary hook shape.

ARCHITECTURAL LIGHTING

Yet Another Use for Plastics

IN business and domestic interiors the new and fascinating possibilities of architectural and decorative lighting are being realized more and more. The call to-day is not only for more light, but for better light—that is, for an increase in the efficiency of diffusion over a given area. As a result of a scientific study of lighting problems, it is now realized that glare and distraction can be avoided by the installation of well-planned units, which need not necessarily give direct illumination; indeed, for certain types of architectural lighting, indirect lighting is essential.

Such are the advances made in estimating technical performance, with due regard to physiological and psychological aspects of human vision, that the results of a lighting installation can be sufficiently calculated and stated beforehand. The days of "trial and error" are fortunately past. There is now no need for the kind of error that means changing something after the installation is complete, because of some unexpected result or effect.

The architectural use of light is one of the most noticeable features of many famous buildings, and it is noticeable that in a large number of cases the line source of light or tubular lighting system is exploited to excellent advantage. Linolite, the pioneer of the line source of light, admirably meets the exacting needs of to-day. It was originated in 1902, when the first double-capped tubular lamp ever made was housed in the first Linolite reflector.

This type of light is used chiefly in cases where a much greater intensity is required in one direction than another. The greatest possible intensity of maximum beam is wanted in the direction where the distance from the source is greatest. The reflector is designed according to its particular purpose to give this variation of intensity radially from its axis whilst maintaining uniform intensity along it.

One of the most interesting of recent developments in tubular lighting has been the use of moulded fittings for carrying the opal lamp. The new decorative two-piece fitting, illustrated above, supplied by Linolite, Ltd., is moulded in Beetle and carries a Maxtrip 2 opal or opalized lamp. The Bakelite base, carrying contacts, can be fixed and wired independently of the cover, which may be screwed on after decorating is finished. "Knock-outs" at sides and ends allow for surface wiring, and there is ample room internally for wire; installation is, therefore, quite simple.

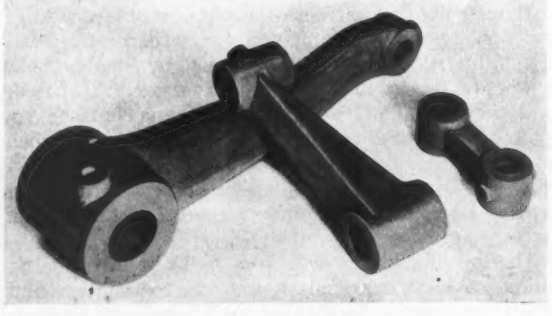
The introduction of these new and attractive plastic fittings should be particularly welcome to architects and others responsible for the layout of lighting systems. Their design is not only streamlined in the modern tradition, but the variety of colours available should greatly facilitate the work of the interior designer and decorator.

Selling arguments in favour of plastic fittings should by this time be familiar, but it might well be stressed that amino resin, whilst being a most attractive and decorative material, is completely unaffected by those conditions which affect the appearance of a number of metallic surfaces. They can be relied upon to give excellent service in all types of interiors, and we look forward to their widespread use, particularly in modern flats, cinemas and ships.

Speeding Up Modern Machinery

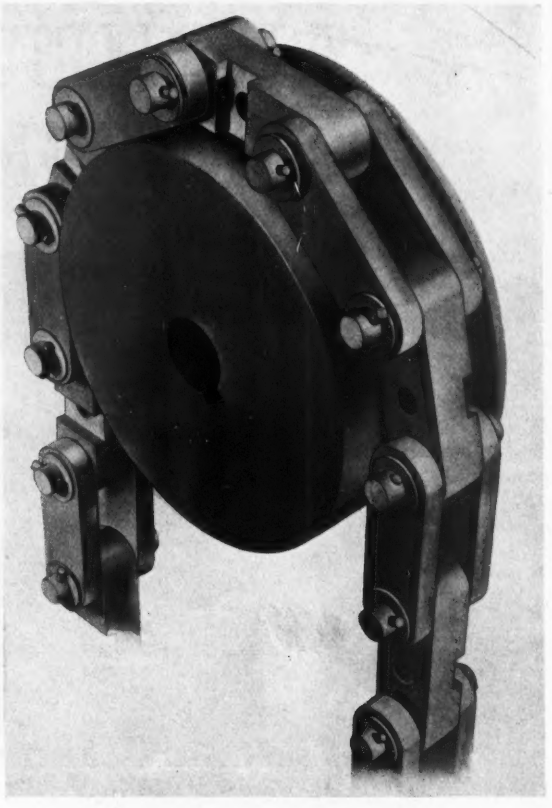
WHERE it is desired to speed up mechanical operations in industry, the use of synthetic resins may—and, in fact, often does—contribute to increased efficiency. A good case in point is afforded by the recent experience of a toffee manufacturer, who found it possible to increase operations from 750 to 1,000 per minute on a toffee-wrapping machine by substituting for heavy metal links lighter ones made of Tufnol, the well-known laminated material of Ellison Insulations, Ltd., made by impregnating fabric with synthetic resin. It is especially interesting to note that this accelerated speed was achieved without any appreciable increase in the amount of power consumed, and thus proved considerably more efficient and yet economical.

Other instances where laminated materials have shown themselves especially useful are in the chemical and metallurgical industries for the construction of special plant. The Tufnol chain shown on this page was used in a steelworks de-scaling plant to draw steel plates through a boiling solution of 1 per cent. hydrochloric acid. Although required to pull 480 lb. it operated successfully when the load was increased to 600 lb. The chain replaced a similar one made of rubber-covered steel, which lasted for only three days. This is particularly interesting in view of the fact that rubber-covered steel is generally prescribed when contact with corrosive acids has to be made.



Links ordered for use on a toffee-wrapping machine.

In both nickel-plating and chromium-plating works Tufnol is now finding important uses. For the former purpose Tufnol pumps are used to pump a solution of nickel sulphate into the vats and keep it in a state of turbulence. Different sizes of pumps have been made to pump solutions at speeds varying from 400 to 1,000 gallons per hour, and although they have already been in use four months they show no signs of deterioration. Reports from chemical engineers showed that previously



Tufnol chain used in a steelworks de-scaling plant.

metal pumps were attacked by the solution and had to be replaced every two or three days. Chromium platers find that as Tufnol bearings require no lubricant other than the acid solution in which they are immersed, a great increase in efficiency and a reduction in replacements is ensured. Tests show that compared with metal bearings, those made of Tufnol save at least 50 per cent. in power alone, and in addition their use makes possible lower maintenance and inspection costs, and they have a much longer life.

Tufnol is one of the best-known laminated materials, and finds a growing number of important uses in many fields of industry. It is similar in appearance to horn and is made in sheets, tubes, rods, bars, angles and channels. As it is homogeneous and non-hygroscopic, it is completely unaffected by climatic conditions, and although possessing good mechanical strength the material is only half the weight of aluminium. It resists oil, petrol, most acids, chemical fumes, steam and water, and is not attacked by white ants, rodents or other vermin.

In addition to the possession of excellent physical properties, Tufnol can be sawn, drilled, tapped, screwed, punched, planed and otherwise machined with the usual engineering tools. Eight brands are available for special uses; some are recommended for use where mechanical strength and resistance to shock are required, and find application for such things as gear wheels which have to satisfy the requirements of British Standard Specification No. 668. Others are more suitable for uses where the highest electrical insulation coupled with high strength are required.

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

I.P.I. Transactions

ON the front page of the collected Transactions of the Institute of the Plastics Industry, which have just been published, there is a quotation from Goethe: "A philosopher must always station himself in the middle." A wise saying this, when we reflect that at so many scientific or technical meetings the need for remembering it is so important and yet so frequently forgotten.

The present volume collects in one cover the eight papers and debates that were read and discussed before the Institute between October, 1937, and December, 1937. It is important to re-read them and refresh one's memory of what one saw and heard.

The first of the series was Mr. C. H. Glassey's paper entitled "A Salesman's Outlook on Future Development in the Plastics Industry," in which he spoke so learnedly of modern moulding methods and problems that one could scarcely entirely believe his confessed ignorance of engineering. His remarks on the relationship between moulders and engineers were particularly enlightening, as were those on the future of automatic moulding and the types of powder necessary for such work. The discussion which followed was, perhaps, even more lively than the paper itself and is well worth close perusal.

Then follows Mr. Kenneth Chance's by now famous paper on "The Function of Art in Industry," in which he attacked with such courage the artist who was content to design for the plastics industry, without any knowledge of plastics or of the technique involved in moulding or fabricating them. Mr. Chance, it will be remembered from our original report of the paper, insists on the fundamental importance of the possession of such knowledge and that artists should acquire it in the works. He has since backed his arguments by the offer to the Institute of a post-graduate scholarship, so that a pupil who has actually completed his training in the industry may complete it in an art school. The Institute has accepted the offer and administers that scholarship.

One did not need to be a chemist to have enjoyed Sir Gilbert Morgan's paper on "The Trend of Research in Plastic Materials." He first discussed the economics of the industry, so that in this volume we have what must be the most recent and complete world figures of production yet published. More fascinating was his description of the nature of resins and X-ray examination of resins, the new developments in producing moulded forms from chlorinated rubber, and what are called the semi-synthetic resins, that is, those made from the natural products, gambier, quebracho and mimosa, better known to the tanning industry than to plastics. By interaction with formaldehyde they produce excellent laminated and moulded products.

Those who are anxious to know how far plastics enter the telephone industry must read Mr. E. Marden's excellent review entitled "Plastics in Telephone Engineering." which dealt with the wide range used, from ebonite, casein, phenolic and amino resins, cellulose acetate and polyvinyl chloride. Most important is the inclusion of the requirements of the telephone industry, and much data regarding the physical properties, electrical and otherwise, of the plastics employed.

For the moulder and the engineer in the moulding shop, Mr. J. L. Daniels, in his "Generation, Storage and Transmission of Hydraulic Power," gives us one of the simplest, and yet satisfying, expositions we have yet seen.

Finally, we have in "The Production of the Vacuum Cleaner," by F. B. White, a detailed description of the manufacture of this most modern and indispensable adjunct to modern life and of the many ways in which plastics form an essential part of it.

Water Treatment with Resins

It is nearly a year ago that we first gave publicity in these pages to a surprisingly new method of treating water for industrial and other purposes. It will be remembered that the discovery had been made that certain synthetic resins had the extraordinary property of removing the salts contained in ordinary "hard" water, and as there are two portions to a salt, a metallic and non-metallic portion, two types of resin are necessary for the removal—a phenol-aldehyde type and an amino type.

We had then hinted that a famous company dealing with water-softeners, domestic and industrial, had interested themselves in the process and, indeed, were employing Mr. G. Leighton Holmes to continue the research he had carried out on the subject at the Government Chemical Laboratories at Teddington.

In a recent lecture delivered before the Hull Chemical and Engineering Society on "New Methods of Water Treatment," the authors, Holmes and Stevens, divulged that the company in question, United Water Softeners,

Ltd., who are so well known through their Permutit process, have now made commercially available new resins for industrial plants. The removal of acidity in effluent waters is especially indicated.

Mr. H. C. Bryson

Our readers will doubtless be interested to learn that our contributor, Mr. H. Courtney Bryson, has now joined the staff of the well-known firm of Messrs. Scott, Bader and Co., Ltd., supplying raw materials of all descriptions to the plastics industry. He is in charge of the laboratory, which is being extended and will deal with all technical questions arising in connection with fillers and pigments.

Obituary

The death occurred on April 24 at Bühlerhöhe, Baden-Baden, of Mr. H. M. N. Hotopf, Joint Managing Director of J. M. Steel and Co., Ltd., Chemical Merchants, Kern House, 36-38, Kingsway, W.C.2.

Mr. Hotopf, who was born in Newcastle in 1881, joined the Badische Aniline and Soda-Fabrik in 1906 and was transferred to London in 1912. In 1916 he went into partnership with the late Mr. A. P. Stott, forming the firm of Stott and Hotopf, and, except for a period of two years when he served his country during the war, continued in this partnership until 1926, his interests then being merged in those of Messrs. J. M. Steel and Co., Ltd.

PERSONALITY CORNER

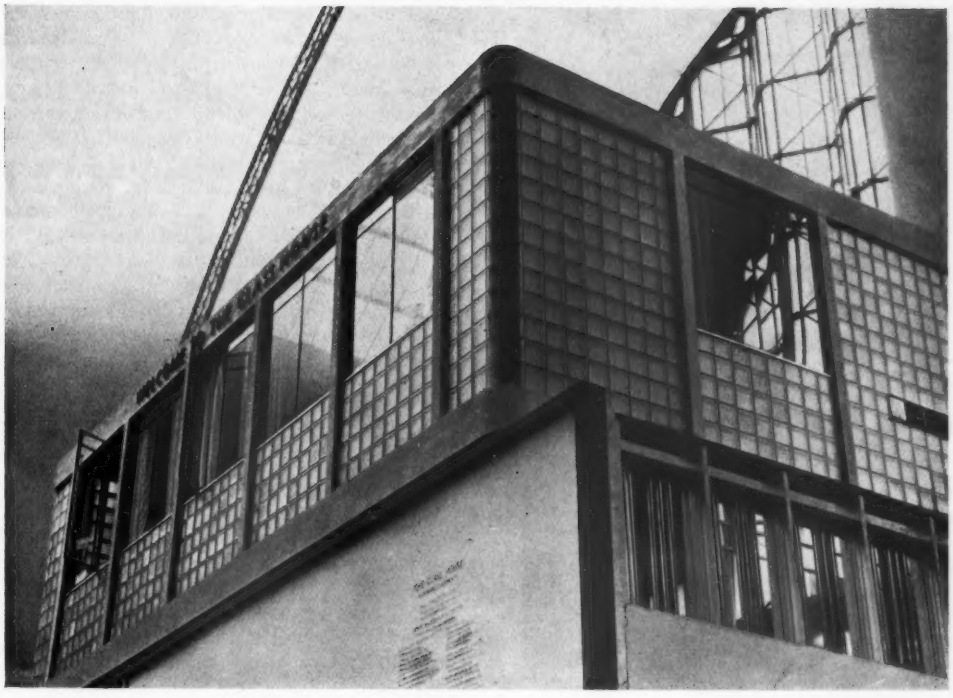
OUR subject this month is Howard Vincent Potter, noteworthy for being not merely a famous chemist, and one of the earliest of them that delved into the strange mysteries of phenol formaldehyde resins, but also for being that rare type of worker that is the answer to the problem evergreen in chemical circles, "Why does not the chemist in industry reach the highest executive posts?" For he has reached it in Bakelite, Ltd., being its very able managing director.

So new is our industry that we are tempted to start our history with "way back in 1914"! It was then that Mr. Potter, after having passed his "final" at King's College, London University, picking up *en route* a Silver Medal in Chemistry, joined the Damard Lacquer Co., Ltd., as research chemist. This concern was manufacturing phenol-formaldehyde in alcohol solutions to replace shellac used for lacquering brass bedsteads, which were then as popular out East with the Indian potentates as they were in Tooting and in Wallasey.

The job was to discover wider fields of application for these new resins. During the war they were largely employed for producing laminated sheet for insulation. But by 1917 Damard Lacquer Co., Ltd., had produced their first moulding powder and so began in this country an industry whose widespread ramifications were then undreamed of. Then in 1926 came the formation of Bakelite, Ltd., by the fusion of Damard Lacquer Co., Ltd., and others, and its success has been Mr. Potter's.

We shall not go into any psychological reasons for Mr. Potter's attainments. He is soundly scientific, a business man of the first order, and possesses a rare fund of humour. Surely these are reasons enough? It may seem queer to some for a scientist to be a business man, and a good one to boot, but it is not so uncommon. Mr. Potter has told us with enormous satisfaction of his early life as a practising pharmacist. Doubtless it was then that he had engrained in him his first lessons of world economics and had kindled in him that quality of human kindliness and understanding that has never left him.

Mr. H. V. Potter, B.Sc., F.I.C., M.I.Chem.E., Managing Director of Bakelite, Ltd.



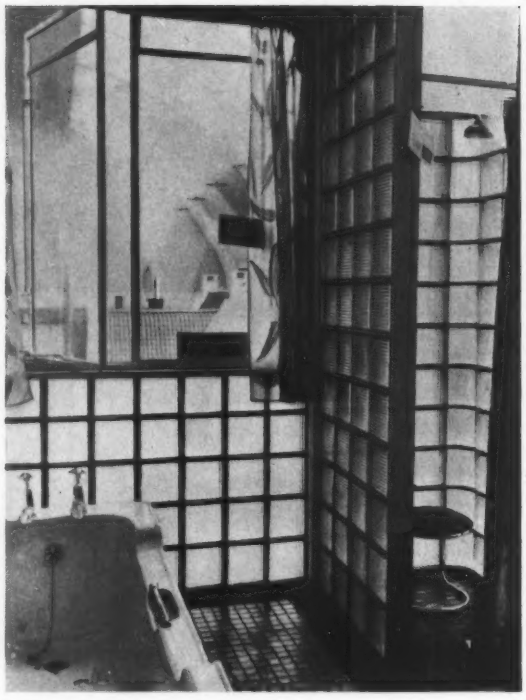
WANTED—A PLASTICS HOUSE

Some Thoughts on Seeing the Glass House at Olympia

WE suppose, and indeed we hope, that hundreds of our readers visited last month that very excellent show, the Ideal Home Exhibition, the hardy annual held at Olympia under the auspices of the *Daily Mail*. If so, they will have been struck especially by the chief exhibit, the Glass House, which was given pride of place in the Grand Hall, and which was constructed with the co-operation of the Glass Manufacturers' Federation and the Plate Glass Merchants' Association.

We have immense admiration for this structure and for those whose initiative caused its erection; not only for beauty of its design, but also for a worthy and, we are sure, successful attempt to obtain widespread publicity for glass as a medium for structural purposes.

The beautiful staircase in the Glass House.



The bath and shower rooms in the Glass House.

It seems strange at first sight that glass should need publicity, for we see it all day and every day in our homes and elsewhere. Yet it does, for many new uses for it have been discovered in recent years.

Consequently, as a means of advertisement, the Glass House is magnificent in conception and in achievement, with its glistening walls constructed of solid glass bricks, its appearance of strength and cleanliness. As the booklet said, it looked "like some exclusive summer villa on a sunny Mediterranean coast, and hints what our homes might be in a smokeless England of 1950." The photographs we publish here show that this is no mean boast.

The bricks are fluted and are four inches thick, the fluting permitting no observation of the interior from the outside, yet the outside light passes through them and is well diffused. There is an amazing sense of light and spaciousness throughout. Glass decorations are widely used for doors and for the staircase, while to produce a soundproof bedroom there is a special quilting beneath the floor of glass silk.

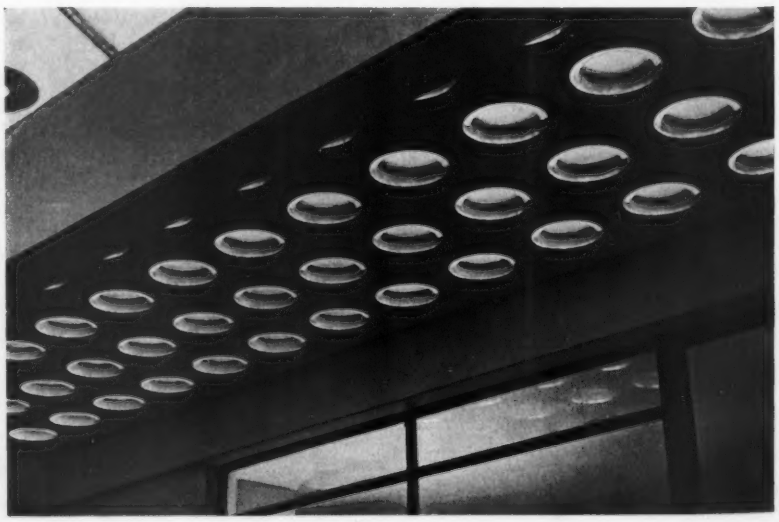
How far such houses and such ideas will be adopted in this country we shall not try to guess. We should prefer waiting, seeing and living in such a structure during one of our typical February days. Nevertheless, it made us very envious during our visit, and brought hopes of seeing one day a similar structure in different materials, a structure that would show even to better advantage and one that would be more amenable to present-day demands—we refer to a Plastics House.

Similar hopes, no doubt, surged through the breasts of many of our readers, and, indeed, there has already been expressed a desire to see what is, perhaps, more important—a permanent home for plastics similar to the Building Centre in Bond Street, where anyone interested in building may see the latest materials and ideas to make a modern home in the best sense of the word. Indeed, several companies concerned in the manufacture of plastics, raw materials and finished goods have permanent stands at the Building Centre.

But in spite of its undoubted excellence and value, the Building Centre could not compare as a weapon of publicity to the same extent as would a Plastics House in the Ideal Home Exhibition.

It would in one swoop convey to the vast buying public, more than by any other method, what plastics really mean and the part they play in life, making it healthier and more colourful, eliminating drudgery for the housewife and introducing the million new objects that cannot be so efficiently made by any other material.

There would be wall and door structures, utilitarian and decorative, fireproof and soundproof; household furniture, from tables and chairs to trays, radio cabinets and cake-stands; kitchen and attendant apparatus, from vacuum cleaners and irons to draining boards, cream mixers and the thousand and one objects now so common; bathroom equipment, from taps to towel-holders and tiles. And for special decorative effects there is no lack of plastics, either moulded or cast, laminated or hand-worked, in such a rainbow of colour as would make the Glass House appear but a memory of pale insignificance.



A novel method of introducing light on a veranda with glass.

Inquiries and Answers

Moulded Speed-limit Signs

J.W.K., Manchester, and T.U., Darwen, have written letters requesting more details regarding the speed-limit discs we saw at the stand of Ebonestos, Ltd., and ask what is meant by our statement that the discs consist of some 17,000 lenses. We have, therefore, pleasure in publishing this month a close-up of one of the 30-mile-

an-hour limit signs. It shows clearly the individual "lenses." Actually they act as reflectors. The whole sheet is moulded from transparent "Diakon," the red surround being sprayed on afterwards. The "lenses" are, of course, not separate, but form one coherent sheet.

Plastic Paddle Blades

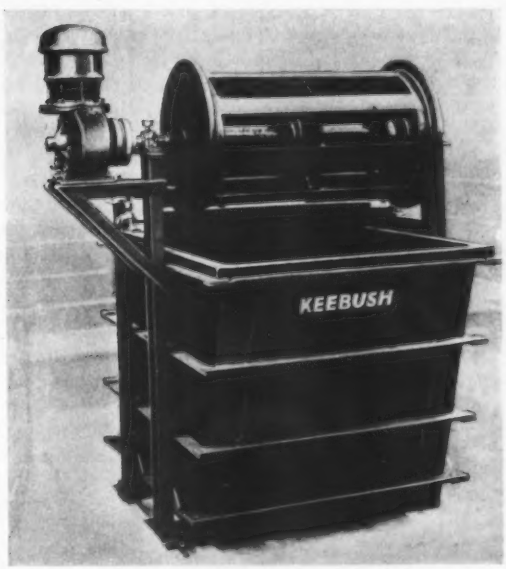
Perth.

To the Editor, *Plastics*.

Dear Sir,—We are interested in the February copy of *Plastics*. We are also interested in the article by Mr. Argent. He states that paddle blades used for propelling garments in the dyeing vats are also worthy of consideration. For some vats we have Staybrite paddle blades, but for our 500-gallon vats we use wooden paddle blades. We make those blades out of material 2 ft. 6 ins. long by 2 ft. wide by 1 in. thick. Would a solid plastic sheet be possible? Would it be too expensive and would it stand up to boiling liquors? Can you tell us the most likely firm with whom we can communicate so as to investigate the possibility of the use of paddle blades in plastics? Any help you can give us along these lines will be appreciated.

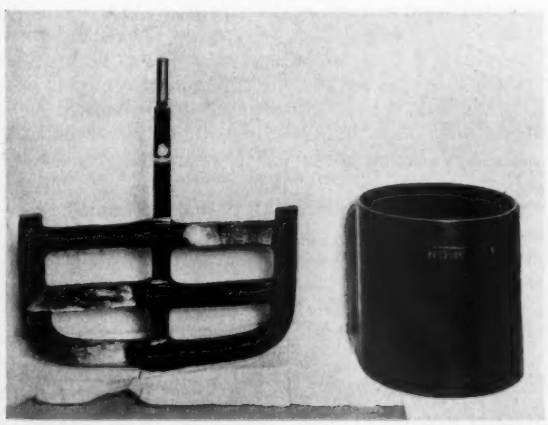
J. Pullar and Sons, Ltd.

[Editor's Note.—Plastics have been used for some considerable time for making paddle blades and complete agitators for the dyeing and chemical industry, so that, presumably, taking into account the advantages to be gained, such plant is not too expensive. One of the best-known firms who carry out such work is Kestner Evaporator and Engineering Co.,



Complete dye-vat in plastics.

Ltd., 5, Grosvenor Gardens, London, S.W.1. The material used is known under the trade name of Keebush. It permanently withstands reasonably high concentrations of acids, but is not suitable for alkalis. It can safely be used with many boiling liquors up to a temperature of 130 degrees C. (266 degrees F.). The above company have sent us the accompanying photographs to show what has been done in this country.]



Agitator and tank of Keebush.

Catalogue Covers

Liverpool.

To the Editor, *Plastics*.

Dear Sir,—We wonder if you could assist us in the following. We have to produce a catalogue of sanitary fittings, Spirax bound, and were wondering if any plastic material could be obtained (in sheets) to use for the cover of the catalogue (size 11½ by 9). We seem to

remember a production issued by the *Architectural Review* in collaboration with Sir Bernard Tate and Lorne (architects). The material would have to be capable of being punched for the Spirax wiring. The idea of using a plastic is that it would convey a very good impression of enamel, etc., as used for the actual sanitary fittings.

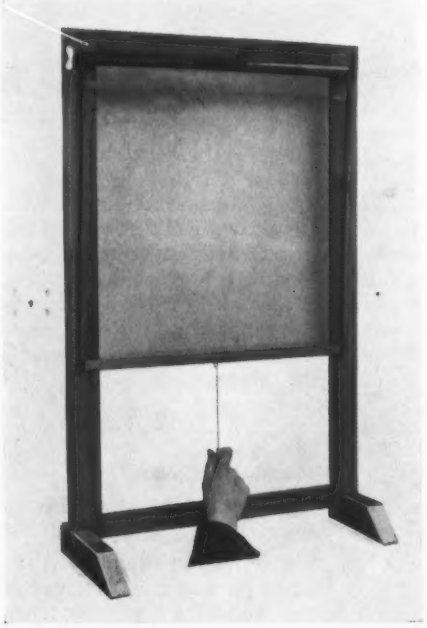
SAMUEL HILL AND READER, LTD.

[EDITOR'S NOTE.—Plastics sheet is readily available for the purpose in view, for which it is admirably suited. Both transparent and opaque sheets are made in any colour and, within limits, in any thickness. A very suitable thickness is about 10/1,000ths of an inch. As they are highly polished, the opaque coloured sheets resemble enamel very closely. The following are firms making the product:—British Celanese, Ltd., Celanese House, Hanover Square, London, W.1; British Xylonite Co., Ltd., Hale End, London, E.4; May and Baker, 42-3, St. Paul's Churchyard, London, E.C.4.]

Protective Sunblinds

G.O.D., of York, complains that the photograph of the sun blind we published in our "General Release" of April at the head of page 119 did not explain much. That is quite true, but we cannot give too many details in the "General Release." However, the topic does deserve more space, and we have been able to obtain some data regarding the material used from the distributors in this country, May and Baker, Ltd.

The blind is of Rhodoid cellulose acetate, is tinted yellow, and in the coloured sheet is sold as Rhodialine Yellow U. This material has been specially evolved by the manufacturers to exclude the ultra-violet rays of the sun, and so enables goods in shop windows to be fully protected from these rays while being perfectly visible. The extent of damage to materials in shop windows—foodstuffs, confectionery and textiles which fade in sunlight—is very great, so such methods of protection are worth close consideration.



A simple form of acetate blind.

The photographs published here show a window fitted with a blind made from Rhodialine and details of a simple blind. In the former case it will be seen that visibility is excellent. The sheet is very strong and flexible and is washable.

Mipolam

Birmingham.

To the Editor, *Plastics*.

Dear Sir,—As a regular subscriber to your very informative paper, I should be extremely obliged if you could tell me what the chemical name of Mipolam is, also if the enclosed sample is Mipolam. This particular sample, I am informed, is supposed to be resistant to chromic acid and is of German origin. Thanking you for any information you may be able to give.

L.C.H.

[EDITOR'S NOTE.—The sample received is probably Mipolam, or a similar plastic made from vinyl chloride. It has the appearance of one of the Mipolam group (it is hard, tough, translucent in thin pieces), it is thermo-plastic and contains chlorine. There are several plastics derived from vinyl chloride ranging from soft rubber-like materials to hard tough substances. Mipolam is referred to chemically as a polymerized vinyl chloride, but mixtures with other plastics such as the styrene resins are also available, so that it does not follow the sample submitted contains only Mipolam. A difficult analysis would be necessary before more exact information could be given.

It is extremely interesting that it is claimed to be resistant to chromic acid, one of the strongest oxidizing acids and which normally attacks all organic materials. If so, it suggests use for chromium-plating baths and for lining chemical plant. Probably this outlet has already been exploited.]

Ester Gum

C.A.N., Northfield, Birmingham. Ester gum may be obtained from A. Boake Roberts and Co., Ltd., London, E.15.

TRADE AND PERSONAL NOTES

A site has been acquired at **Dagenham, Essex,** for the erection of a factory for making plastic buttons.

The Glasgow Exhibition will be open from May 3 until October 29, and the grounds will remain open from 10 a.m. to 11 p.m. daily. The exhibits will be on view from 10 a.m. to 9.30 p.m. from Monday to Friday, and from 10 a.m. to 10 p.m. on Saturday.

The latest issue of *Bakelite Progress*, the house organ of **Bakelite, Ltd.,** contains a number of stimulating and well-illustrated articles dealing with some of the latest applications of their moulding powder. One of the most interesting features of this issue deals with "Moulded Components in the Modern Car." It is predicted that, whilst the completely moulded car body is not so improbable as it might at first appear, a more likely development may be a body combining both plastic mouldings and metal.

Mr. Peter F. Bennett, O.B.E., J.P., has been elected president of the Federation of British Industries for the coming year. Mr. Bennett is chairman and managing director of Joseph Lucas, Ltd.

The Report of the **National Physical Laboratory** for 1937 has just been published and may be obtained from H.M. Stationery Office for 2s. 6d. net.

The **1938 Radiolympia Exhibition** will be held from Wednesday, August 24, to Saturday, September 3, inclusive.

We have received further particulars regarding the **Rubber Technology Conference,** which is to be held at the Hotel Victoria, London, W.C.2, on May 23 to 25, 1938. A full list of the officers of the Conference includes Sir William Bragg, O.M., K.B.E., M.A., D.Sc., P.R.S., honorary president of the Conference, and Mr. S. T. Rowe, the president. A number of important scientific bodies are to co-operate, and judging from the titles of the papers to be read a most interesting meeting is assured.

Shareholders of **British Industrial Plastics, Ltd.,** have been notified of the sale of the company's goodwill in the manufacture of certain chemicals, including yellow prussiate of soda, to the Manchester Oxide Co., Ltd.

The telephone number of the **Institute of the Plastics Industry** has been changed from Victoria 3995 to Abbey 3995.

Hercules Powder Co. have just issued an informative booklet describing the properties, chemical, physical and mechanical, of their chlorinated rubber.

Last year's shipments of **latex,** measured by their dry rubber content, totalled 34,490 tons, against 28,494 tons in 1936 and 20,898 tons in 1935. The 1937 figure was made up of 19,408 tons from Malaya, 13,650 tons from the Netherlands East Indies, and only 1,432 tons from other districts.

The London Shellac Trade Association has adopted standards for Indian seedlacs, six in number.

David Bridge and Co., Ltd., of Castleton, Manchester, have issued a special descriptive booklet describing their Brodert mixing and grinding mill, which should be of interest to firms manufacturing cellulose and other preparations.

R. H. Cole and Co., Ltd., Spencer House, South Place, E.C.2, have sent us a copy of a most interesting booklet, which describes very fully the properties and applications of the wax-free shellacs produced by Stroever and Co., Bremen, for whom the English firm are the sole British concessionaires.

Brown and Forth, Ltd., Clifton House, 83-117, Euston Road, N.W.1, have issued a booklet dealing with their "Hydranol" resins, which combine many of the advantages of both natural and artificial resins.

Mr. T. B. Philip has left the Kestner Evaporator and Engineering Co., Ltd., to join the staff of The Distillers Co., Ltd.

The latest publication of **Thos. Firth and John Brown, Ltd.,** is entitled "Steels," and gives a good deal of most useful information regarding all types of steel produced by this well-known firm.

The Lea Manufacturing Co., of Waterbury, Conn., have sent us particulars of their "Learok" buffing compound for plastics. The material can be obtained tinted to match the colour of the finished article.

"Determination of Benzole Vapour in the Atmosphere" and "The Use and Care of Respirators" are the titles of two most interesting booklets issued to factory managers by the **Air Hygiene Foundation,** 4400, Fifth Avenue, Pittsburgh, Pa., a non-profit organization for the advancement of industrial health.

The Holden Vale Manufacturing Co., of Haslingden, are to manufacture chemical cotton. The company, in which the Bleachers' Association is interested, has been registered with a nominal capital of £200,000. The works of the former Holden Wood Bleaching Co., closed by the Bleachers' Association in 1935, have been entirely remodelled and big extensions have been made for the accommodation of new plant. The works will employ about 100 men.

John Pearce (Interior Decorators), Ltd., has been formed with a nominal capital of £1,000 to carry out the business of manufacturers and dealers in plastic and moulding materials.

British Transparent Containers, Ltd., has been formed to acquire the sole rights to manufacture in the British Empire collapsible tubes and containers of cellulose acetate and other materials manufactured by Fadutub A.G. Nominal capital, £100 in 5s. shares.

British Artid Plastics, Ltd., has been formed to carry on the business of manufacturers, producers and workers of, and dealers in, plastics and plastic substances of all descriptions. The registered capital is £10,000.

Synthetic Rubber Products, Ltd., Ibex House, Minories, E.C., is a new company formed to carry on business as manufacturers and dealers in rubber and synthetic substances. Nominal capital, £5,000 in 20,000 ordinary shares of 1s. and 4,000 preference of £1.

The Dunlop Rubber Co., Ltd., has declared a dividend of 9 per cent., less tax, on last year's trading, including 1 per cent. bonus. Net profit for the year amounted to £1,591,017 (against £1,502,707 for last year).

The Viscose Development Co., Ltd., announce for last year a net profit increased from £6,410 to £9,014, plus £120 brought in. Dividend on ordinary shares is 6 per cent. and the same on non-cumulative participating preference.

The United Glass Bottle Manufacturers, Ltd., made a profit last year of £249,001, plus £43,845 brought in, compared with £145,493 for the previous year. Ordinary rate is 12 per cent., including 2½ per cent. cash bonus.

New Industries in South Wales

Good progress continues to be made at the Treforest Trading Estate, which is rapidly becoming a centre of new industries in South Wales.

Official reports show that at the end of March, only 15 months from the time when work was begun in preparing the site, six tenants were in active production.

The goods now being manufactured on the Trading Estate are:—

Steel reinforcement for concrete.
Moulded toys.
Toilet and fancy goods.
Watch straps.
Chrome leather.
Electric storage batteries.

Some of them were exhibited at the Welsh Industries Fair, Cardiff, on the stand of South Wales and Monmouthshire Trading Estates, Ltd.

A new tenant just in occupation is Messrs. Coupe and Tidman, Ltd., makers of refractory materials of a kind not previously made in South Wales, who hope to start production at the end of the month. One kiln is nearing completion and two more are to be constructed. There will be work eventually for 45 to 50 men, all of them local.

Worldwin Pistons, Ltd., who have had a small factory at Merthyr Tydfil, are starting the production of Diesel pistons at Treforest this month with 50 hands, all local. "Adaptable and enterprising," is how they describe the local labour. The aim is to develop the manufacture of speciality aluminium castings of various kinds. It is hoped to employ 300 hands eventually.

Other goods to be produced on the Trading Estate by firms already announced are coated papers and boards, dry-ice, activated carbon, electrical switchgear, typewriter ribbons and carbons.

A new aerial view of the Treforest Trading Estate showing the new main road and the twenty-six new factories.

This work so far employs only 135 men and women, but, with the exception of an occasional key man, they are all local.

Nearly 900 men are still employed in building and development work on the estate, of whom all but 44 are local.

The social amenities on the Trading Estate are not being forgotten. Two canteens are being built which will provide meals for 500 to 700 people at one time, and they are being designed for social gatherings.

One of the largest moulding plants in the world was recently opened at Cambridge, Ohio, by **Reynolds Molded Plastics,** Division of Reynolds Spring Co. The two-story building, which is 450 ft. long by 135 ft. wide, is centred in a five-acre plot.

We have just received some information regarding the **Syntron Electric Vibrators,** manufactured by the Syntron Co., of Homer City, Pa., and from all accounts their use on presses is more than justified by the uniformity of the mouldings.

The 11th ordinary meeting of **Imperial Chemical Industries, Ltd.,** was held on April 21 at the Queen's Hall, Langham Place, London, W. The Rt. Hon. Lord McGowan, K.B.E., D.C.L., LL.D., the chairman, presided, and in his review of the company's activities during the past year mention was made of "Valen," the new water repellent and also rubber plastics. Referring to the latter, Lord McGowan said: "In our research work on rubber plastics and polymers of various kinds, we continually discover materials with new combinations of physical and electrical properties. Our task is to identify the effects of these combinations and then to find application for them. Normally, they will replace other materials, natural or manufactured, at a lower cost. At present, we have a number under examination, one of which promises to provide artificial bristles, and another has a unique combination of electrical and mechanical properties."

The **Board of Inland Revenue** informs us of the following additions to be made to the official list of agreed wear and tear allowances of aircraft manufacture. For plastic plant and machinery generally 10½ per cent. is specified. (The above-mentioned rate is to be regarded as covering circumstances of overtime or continuous working up to and including a complete double shift. Where working exceeds double shifts, applications for increased allowances are to be dealt with on their merits.)

We have just received an interesting brochure issued by the **General Lighting Information Service** containing a large number of informative abstracts for the attention of makers and traders in the lighting or supplementary line of business. A study of this publication shows the vast possibilities and potentialities of the lighting market, and those who contemplate catering for it will be well advised to subscribe to the G.L.I.S. for a period of a year. The subscription in the United Kingdom is 30s., and this entitles the holder to a copy of the next ten issues at 3s. each. All inquiries should be addressed to H. L. Julinsburger, 70a, Ladbroke Grove, London, W.11.

B.B. Chemical Co., Ltd., Ulverscroft Works, Leicester, have sent us a sample of their 7A Bostik Label Cement, which is specially suitable for metal surface. The cement should be brushed on to the label, which then needs pressing down on to the plastic or metal surface, immediately followed by a rub over to ensure perfect contact. 7A Bostik Label Cement can be exposed to the weather over long periods without deterioration.

NEW MATERIALS—NEW PLANT—NEW METHODS

The **"Hand-ee" Electrical Hand Tool** distributed by Charles Churchill and Co., Ltd., Coventry Road, South Yardley, Birmingham, is suitable for grinding, drilling, cutting, carving, polishing and, indeed, many other operations. As many as 200 accessories are available and these can be changed in a few seconds by means of an interchangeable collet chuck. The tool is 6 ins. long and weighs only 12 oz., and is equipped with a special rotary switch which enables it to be under proper control during use.

We have received some interesting particulars from **Howards and Sons, Ltd.,** Ilford, regarding the use of their Sextol Stearate as a mould lubricant.

Reducing Die and Mould Costs

During the past 10 years there have been some striking developments in the production of telephones, wireless components, vacuum cleaners, typewriters, refrigerators and other products, all of which include pressed or moulded components.

There are several factors which are responsible for these developments—the economical methods of production afforded by the use of modern power presses, the advent of plastic materials such as Bakelite and the development of machine-tools for the rapid production of dies and moulds.

Of these three factors, machine-tools for dies and moulds have played an important part in the reduction of costs. The old methods of milling dies roughly to shape and finishing by slow and laborious hand operations were extremely costly.

They are now replaced by such machines as Keller Diesinkers, Gorton Die Millers and Taylor Hobson Diesinking machines, all of which will produce dies and moulds from easily moulded master forms in less than half the time taken by the older methods.

Keller Diesinkers will produce automatically all kinds of dies including forging and drop stamping dies, blanking, beading, trimming and panelling dies for sheet metal work, metal patterns and dies for castings, brass stamping dies and bottle moulds, embossing and forming dies, jigs, fixtures and other toolroom work.

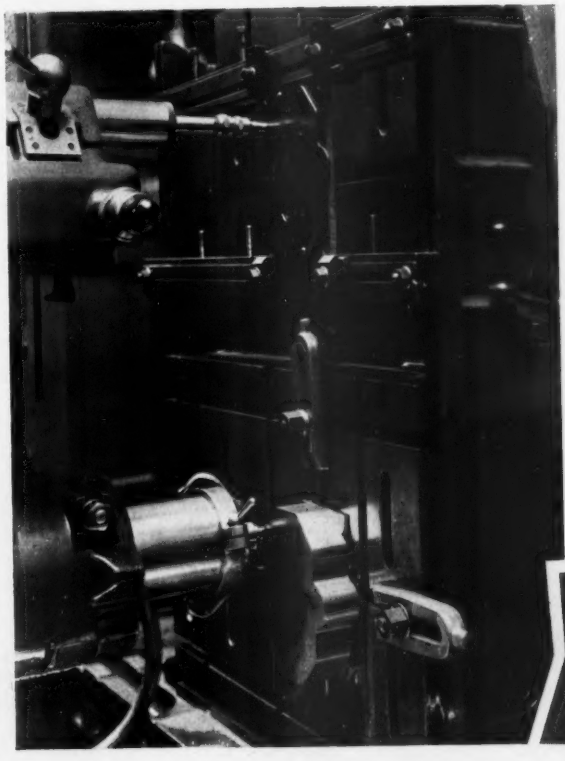
The work is produced to within fine limits, master forms of lead, cement, plaster or wood being used. Very little hand finishing is required.

The photograph at the bottom of this page shows a close-up of the Keller Diesinker machining the die for a Bakelite moulding. The tracer has just contoured the outside of the templet. The time taken to this stage was five hours. The next operation was the machining of the inside and jig boring of the holes.

Moulds for a complete toy telephone in mottled Bakelite are shown in the second picture and were all produced on the Keller machine. The telephone and base are at the back and underneath is the Titanite mould for producing the die to form the inside of the base. The male and female parts of the two halves of the instrument are shown with the wooden master. At the right front the wooden model of the base is seen used for making the die.

The right and left-hand top and bottom dies for the handpiece took 73 hours and the top and bottom dies for the base 78 hours.

Alfred Herbert, Ltd., Coventry, who handle the Keller Diesinker machines, are always pleased to demonstrate them to manufacturers interested in reducing tool production costs.



(Left) Keller Diesinker machining a die for a Bakelite moulding.

(Right) Toy telephone dies produced on the Keller Diesinker.

PATENTS RELATING TO PLASTICS

These abridgments of recently published specifications are specially compiled for this journal by permission of the Controller of His Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet, as issued, on payment of 5s. per group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address, price 1s. each.

478,854. Cellulosic Films

BRITISH CELLOPHANE, LTD. January 1, 1937.

Cellulosic films are softened by means of a high-boiling softening agent belonging to one of the four classes mentioned below, and which is appreciably water-soluble and has a hygroscopicity of from 1 to 80. The four classes of substances are compounds containing (a) both ether and ester groups, (b) keto and ester groups with or without ether groups, (c) hydroxyl and ester groups with or without ether groups, but which do not contain more than one hydroxyl group for each ester group, and (d) compounds of carbamic acid esterified with an alcohol containing an ether group.

478,943. Obtaining Cellulose

CELLULOSE RESEARCH CORPORATION. April 23, 1936.

In a process for preparing highly reactive and permeable wood cellulose for paper or for the manufacture of cellulose derivatives comprising impregnated pieces of wood of suitable size with a delignifying liquor under non-delignifying conditions and subjecting the wood to delignification, the wood is first brought into contact with an aqueous liquid heated to or above the boiling point of water to displace the air in the wood by steam, the steam is then condensed to draw liquid into the interstices of the wood which is then subjected to uniform delignification with a delignifying liquor. The aqueous liquid may be the delignifying solution itself, or particularly in the case of an alkaline cooking process, a non-delignifying solution of an electrolyte of specific concentration, e.g., sodium chloride of 10^{-2} molar strength or aluminium sulphate of 10^{-5} molar, which permits subsequent uniform dispersion of delignifying reagent throughout the chips.

478,701. Porous Synthetic Resins

JOHNSON, G. W. (I. G. Farbenindustrie Akt.-Ges.). July 20, 1936.

Shaped elastic masses, suitable as floor and wall coverings and as linings or coatings for wood, metal and stone, are made by shaping hardened urea and thio-urea formaldehyde resins, having a cellular foamlike structure, in a comminuted state, in admixture with binding agents having elastic and sticking properties. Specified binding agents are linoxyn, natural rubber, artificial rubbers such as polymerization products of butadiene or of mixtures of butadiene and acrylic nitrile or styrene, hydrogenated rubber, polymerized isobutylene, polymerized vinyl isobutyl ether, polymerized vinyl ethers or esters and polymerized acrylic esters, and softening agents may be present. Dyestuffs, fillers and natural or synthetic resins may be added, and colophony, colcothar, zinc oxide, sulphur, vulcanization accelerators, and the condensation product from aldol and alpha-naphthylamine are specified in examples. The resulting masses may be drawn out into plates or injected into moulds. When rubber is used as the binding agent, the masses may be vulcanized.

478,699. Labels; Compound Sheet Materials; Ornamenting

BRITISH CELANESE, LTD. July 20, 1936.

A label adapted to be secured to an article by hot-pressing comprises a front face bearing or constituting a legend or device and a back face of fabric having yarns or filaments of a thermoplastic derivative of cellulose, such as cellulose acetate, exposed thereon. The label may be formed from a single thickness of fabric having cellulose derivative yarns woven or knitted therein and exposed on the back face, and the legend on the front face may also be formed by weaving. Alternatively, the label may comprise a front face of fabric woven, knitted, knotted, or netted from wool, cotton, linen, silk, regenerated cellulose or organic cellulose derivatives, or of felt, paper, leather, or metallic cloth, united to a fabric backing containing cellulose derivative yarns as by hot-pressing to cause the cellulose derivative yarns to fuse and adhere to the front layer. The fusion may be aided by a plasticizer or solvent and, if desired, moisture or steam. A plasticizer may be applied to or incorporated in the cellulose derivative yarns exposed on the back of the label to improve adhesion to the article. The labels may be used on wearing apparel, shoes, hats, fabrics, felt, paper, cardboard, and plaster board. They may be in the form of ribbons comprising a series of labels, or monograms, decorations, coats of arms, or trade marks.

479,057. Polyvinyl Acetal Resins

KODAK, LTD. July 30, 1936.

Relates to resins produced by condensation of a hydrolyzed polyvinyl ester and a substance containing a reactive carbonyl group, e.g., an aldehyde or a cyclic ketone. Such resins are de-esterfied to contain 3 per cent. or less ester groups (calculated as polyvinyl ester), the content of hydroxyl groups calculated as polyvinyl alcohol being increased, preferably to about 10 per cent. to 20 per cent. for higher (e.g., cyclohexanone or butyraldehyde) acetal groups, and to about 10 per cent. to 17 per cent. for lower (e.g., acetaldehyde) acetal groups. Preferred de-esterification agents are alkalis, such as caustic alkali or alkali carbonate, or primary or secondary alcohols, such as lower fatty alcohols; and strong acid.

478,043. Compound Sheet Materials

CELLULOID CORPORATION. April 30, 1937.

Sheet leather is stiffened by uniting thereto a sheet of stiffening material comprising a derivative of cellulose by treating the stiffening material with a liquid composition comprising a solvent medium for the derivative of cellulose and an agent which is capable of softening leather, and then pressing the stiffening material and the leather together. Softening agents specified are water; organic acids, e.g., formic or acetic acids; organic bases, e.g., triethylamine, triphenylamine or triethanolamine; and inorganic bases, e.g., ammonia or sodium, potassium or other alkali or alkaline earth metal hydroxides: usually .5—5 per cent. softening agent is incorporated in the liquid composition.

478,664. Chlorinated Rubber

BENNETT, N., and IMPERIAL CHEMICAL INDUSTRIES, LTD. July 22, 1936.

Non-inflammable compositions are made by incorporating with chlorinated rubber one or more of the condensation products made by reacting an aromatic hydrocarbon containing nuclear substituted halogen, in the presence of a Friedels-Crafts catalyst, such as aluminium chloride, with a halogenated hydrocarbon which contains a halogenated aliphatic chain and which may or may not contain in addition an aromatic grouping.

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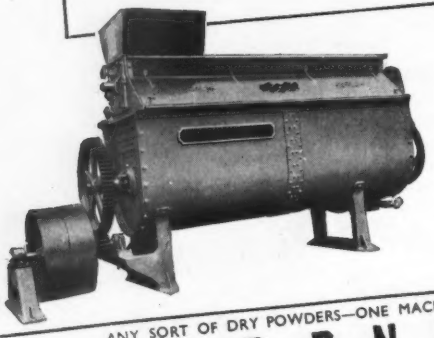

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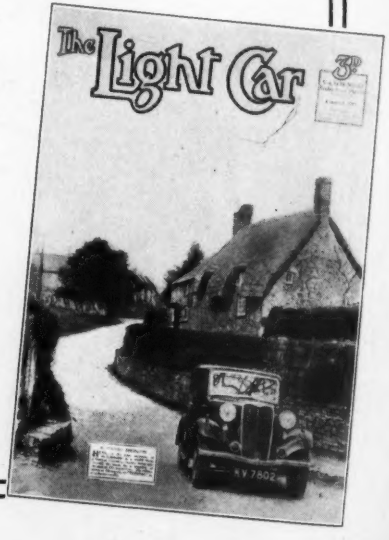

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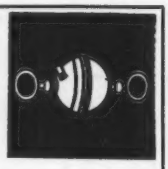

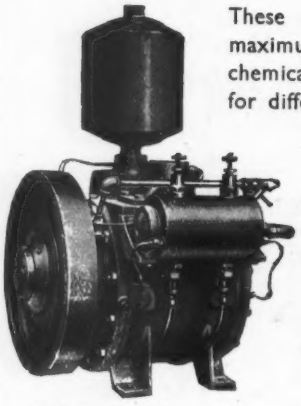

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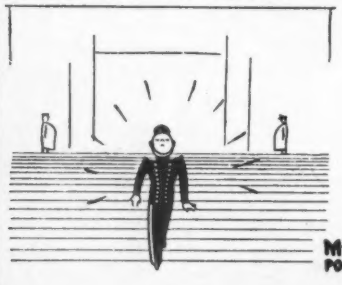

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TERMS.—Monthly accounts, strictly net; due when rendered.

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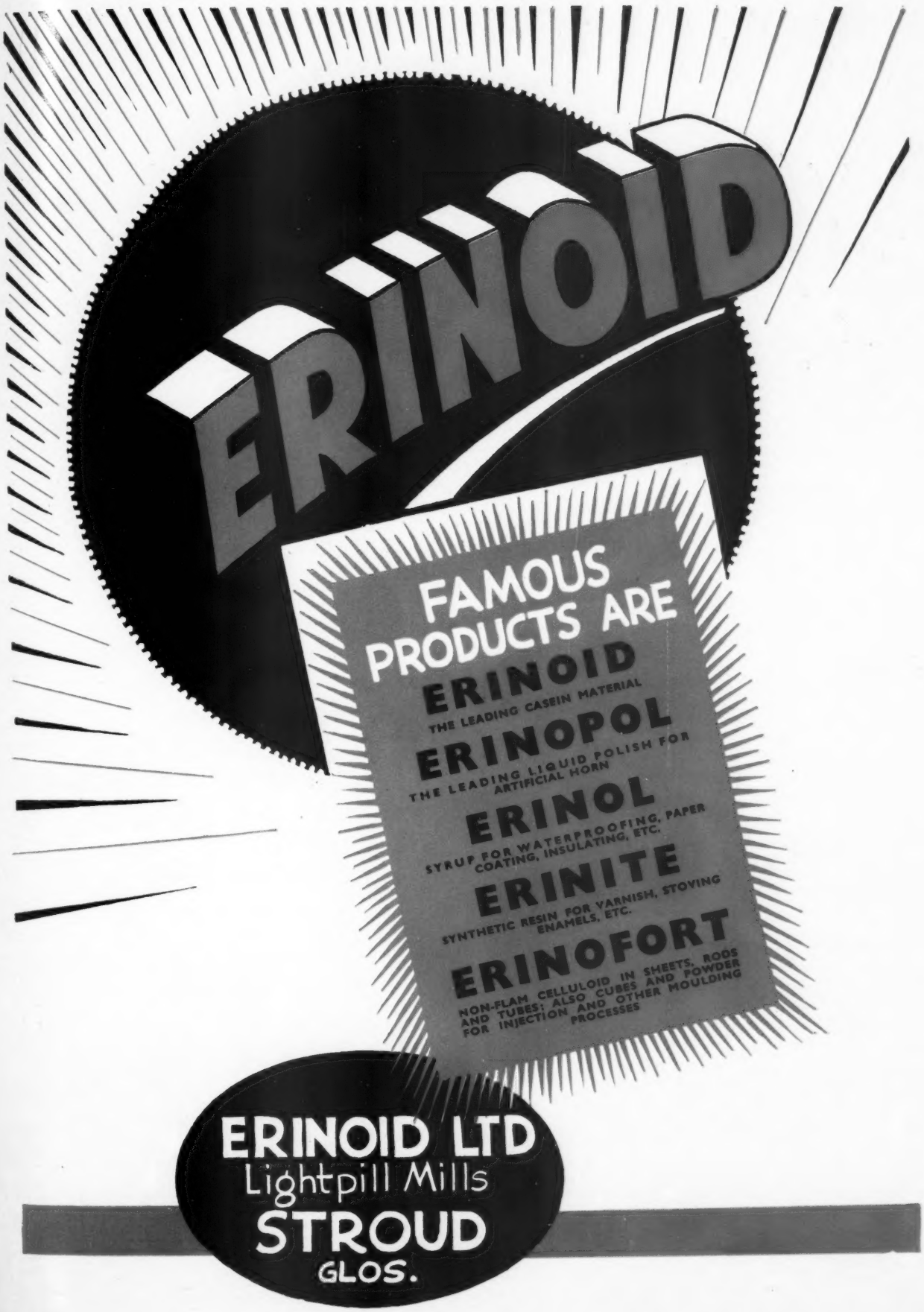
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